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SCHEDL (K. E.). **Der Schwammspinner** (*Porthetria dispar* **L.**) **in Euroasien, Afrika und Neuengland.** [The Gypsy Moth, *P. dispar*, in Europe, Asia, Africa and the north-eastern United States.]—*Monogr. angew. Ent.* no. 12, iv+242 pp., 95 figs., 26 tables, 600 refs. Berlin, 1936. Paul Parey. Price *M.* 12 (in Germany and Switzerland *M.* 16).

In this monograph the author presents a comprehensive survey of published work on *Porthetria dispar*, L., and considers also papers on biological problems having a more or less direct connection with it. The subjects dealt with include classification, genetics, geographical distribution, food-plants, feeding habits and injury done, seasonal course of development and effect of climate on the different stages, and population density and the effect on it of abiotic and biotic factors, as well as measures for control.

WEIDNER (H.). **Aus der Schädlingsabteilung des Zoologischen Staatsinstitutes und Zoologischen Museums, Hamburg.** [Notes from the Pests Department of the Zoological State Institute and Zoological Museum, Hamburg.]—*Anz. Schädlingsk.* **12** no. 2 pp. 13–17, 1 fig., 4 refs. Berlin, February 1936.

A number of pests infesting houses and various materials in Hamburg are noted, including a Pyralid, *Aphomia gularis*, Zell. (*Paralipsa modesta*, Butl.), which infests almonds and was found in a marzipan factory. Two females of *Hylotrupes bajulus*, L., which is a serious pest of the timber of houses, laid 102 and 180 eggs respectively, and the former contained another 28 eggs, some already mature. These figures are higher than those mentioned in the literature [*cf. R.A.E.*, A **23** 155]. A male lived for 41 days. The larval mines and the course of the gallery from the pupal chamber to the exit-hole are described. The emerging adult has to pierce only a thin layer of wood, as the larva bores to just beneath the surface, though it turns back and pupates at a greater depth.

Larvae of another Cerambycid, *Phymatodes testaceus*, L., were very common under the bark of felled oaks. Adults bred out on 14th May lived until 5th June.

BERAN (F.). **Zur Kenntnis der Obstbaumkarbolineumemulsionen. I. Ueber die Haltbarkeit und den Zerfall der Karbolineumemulsionen.** [A Contribution to the Knowledge of Fruit-tree Carbolineum Emulsions. I. On the Keeping Quality and Disintegration of Carbolineum Emulsions.]—*Anz. Schädlingsk.* **12** no. 2 pp. 17–22, 2 figs., 11 refs. Berlin, February 1936.

German papers on the keeping quality of tar-distillate emulsions are noticed. It is here suggested that the term " keeping quality " should apply to the property as shown by the emulsion in full, sealed, standing containers and that the term " disintegration time " should indicate the interval between the application of the spray and the subsequent disintegration of the spray film, when finally only oil is left, either as a film or as droplets. As regards keeping quality, most commercial tar distillates tested came up to the 72-hour standard specified by Houben [*R.A.E.*, A **18** 183]. In experiments on disintegration the author used a home-made emulsion including 72 per cent. neutral oils (hydrocarbons), 4 per cent. organic bases and 6 per cent. tar acids (phenols). Of this tar distillate 4 per cent. boiled below 170°C., 14 per cent. between 170 and 220°, 20 per cent. between 220 and 270°, 10 per cent. between 270 and 300°, and 20 per cent. between 300 and 360°.

A 2–20 per cent. emulsion in distilled water did not disintegrate after standing for 3 months, so that keeping quality was unlimited from a practical point of view. The emulsion had a very high average degree of dispersion, beyond the resolving power of the microscope, *i.e.*, below 0·2 μ. In the microscope field only a few particles with a maximum size of about 1 μ were visible. Disintegration time was tested at 18°C. [64·4°F.] with a 10 per cent. concentration in distilled water exposed in Petri dishes or on bark. In the case of morello cherry, a reaction between the bark and the emulsion caused an unexpectedly rapid disintegration even when surface evaporation of the water was excluded. Disintegration was evidenced by discolouration in 5 minutes, and after 30 minutes there was a thick surface layer of oil. The pH value, which was 9·6 at the start, fell to 9·2 in 5 minutes and 8·8 in 30. Another test showed that the upper layer of the bark was responsible for the disintegration. A further test to ascertain if the fall of the pH value was due to a chemical reaction or to surface absorption indicated that the bark exerted a chemical action on the alkali. With apple bark no change was visible in 5 minutes and only slight discolouration after 30, whereas with plum bark there was marked discolouration after 5 minutes and almost complete disintegration after 30. It is possible that such differences in the behaviour of different barks is, at least partly, a factor in the varying resistance of different trees to the action of tar distillates. Other experiments showed that the time of disintegration depended very markedly on the area of the surface of the emulsion. Disintegration on bark cannot be repaired whereas disintegration due merely to evaporation of water from an emulsion on an inert surface can be reversed by adding water. A number of commercial tar distillates were tested, and the results of this work will be published later.

LANGENBUCH (R.). **Die Bekämpfung des Kartoffelkäfers in Stade 1934.** [The Control of the Potato Beetle in Stade in 1934.]—*Mitt. biol. Reichsanst. Berl.* no. 52, 20 pp., 10 figs. Berlin, February 1936.

This is a detailed account of the measures taken against *Leptinotarsa decemlineata*, Say, in the district of Stade where it appeared on potato in July 1934 [*R.A.E.*, A **22** 560 ; **23** 505, etc.]. From 31st May to 14th June 1935, 5 adults, 2 egg batches, some isolated eggs and 27 young larvae were found in this area. In spite of constant inspection no further finds were made up to the end of September 1935 when measures were discontinued, so that the beetle is considered to have been eradicated.

FORSSLUND (K. H.). **Eine neue Fichten-Blattwespe** (*Lygaeonematus subarcticus* **n. sp.**) **aus Schwedish-Lappland.** [A new Spruce Sawfly, *L. subarcticus*, sp. n., from Swedish Lapland.]—*Ent. Tidskr.* **57** no. 1 pp. 14–22, 6 figs., 9 refs. Stockholm, 1936.

Descriptions are given of the adult, last-instar larva and cocoon of *Lygaeonematus subarcticus*, sp. n., which was responsible for serious injury to spruce in large areas of Swedish Lapland in the summers of 1932–1934. The larva resembles that of *L. abietinus*, Christ, and causes similar damage. Notes on the morphology of the larvae of the *abietinus* group are given from the literature ; it is not possible to differentiate them specifically with certainty. *Eclytus ornatus*, Hlmgr., *Holocremnus* sp., and *Mesoleius* sp. were bred from the cocoons of *L. subarcticus.*

TRAGARDH (I.). **Skogsinsekterna och skogens skötsel.** [Forest Insects and the Management of the Forest.]—*Skogen* H. 3 pp. 47–49. Stockholm, 1936.

The author reviews some of the more important features of the development of forest entomology in Sweden in the course of the last 20 years, during which period he has had charge of work on the subject. Great progress has been made in the knowledge of forest insects that had not previously been systematically studied. For example, the pine sawyer (*Monochamus sutor*, L.), hitherto regarded as living in old stumps, has been found to be the most injurious pest affecting timber [*cf. R.A.E.*, A **18** 268], and *Ips acuminatus*, Gyll., and *Pissodes piniphilus*, Hbst., have also proved to be very injurious to pines. Although a fairly good inventory of the chief insect pests has been made, many gaps remain to be filled. Furthermore, outbreaks of insects hitherto considered rare and unimportant have suddenly developed. Thus *Chermes* (*Pineus*) *pini*, L., caused severe damage for two years in young pine plantations, and the sawfly, *Lygaeonematus subarcticus*, Forsslund [see preceding paper] injured spruce over an area of about 18,000 acres in Swedish Lapland.

The forest entomologist should devote close attention to a study of all aspects of the biology of forest insects, including their anatomy, physiology and ecology, and obtain sufficient data to ensure a statistical treatment of them, and at the same time should investigate their occurrence in relation to the different phases of forest management. It is only by co-ordination of the results of such studies that a real forest hygiene can be established.

FORSSLUND (K. H.). **Några farliga fiender till barrträdens groddplantor i Norrland.** [Some dangerous Enemies of the Seedlings of Spruce and Pine in Norrland].—*Skogen* H. 5 pp. 99–101. Stockholm, 1936.

A brief study in 1935 of injury to seedlings of spruce and pine in an experimental park at Västerbotten showed that they were attacked by the larvae of *Notolophus* (*Orgyia*) *antiquus*, L., *Epipsilia festiva*, Schiff. (*Agrotis primulae*, Esp.), *Mamestra glauca*, Hb., and *Polia suasa*, Schiff. (*M. dissimilis*, Knoch.), and by the Capsid, *Lygus pabulinus*, L.

The injury caused by the different species is described and illustrated. Studies will be continued in 1936, as it is likely that such damage occurs commonly.

WALLENGREN (H.). **Studier över vetemyggorna** (*Contarinia tritici* **Kirby och** *Sitodiplosis mosellana* **Géh.). I. Kläckning, svärmning, larvernas intraflorala liv och utvandring.** [Studies on the Wheat Gall-midges, *C. tritici* and *S. mosellana*. I. Emergence, Flight-period, the intrafloral Life of the Larvae and their Migration.]—*Lunds Univ. Årsskr.* N.F. Avd. 2 **30** no. 4, 71 pp., 12 figs., 19 refs. Lund, 1935. Price *Kr.* 4·25. (With a Summary in German.) [Recd. April 1936.]

The blossom-midges, *Contarinia tritici*, Kby., and *Sitodiplosis mosellana*, Géh., have been very injurious to wheat in Sweden, especially in the south. Barley is sometimes attacked, but to a less degree. In southern Sweden sugar-beet is usually grown after wheat, and as the larvae migrate from the ears in order to hibernate and pupate in the ground, the beet fields become sources from which the new wheat fields are infested. Investigations were therefore made in wheat and beet fields in 1932–34 at Alnarp.

The date of adult emergence varied greatly owing to climatic factors, of which soil temperature and air humidity, especially in May, were the most important. Both conditions were very favourable in 1934, when the average soil temperature in May at a depth of 4 inches was 16·6°C. [61·88°F.], and over an inch of rain in the last week loosened the soil surface so that the pupae were able to reach it easily. In cages placed in the fields emergence extended over 23–30 days ; one individual of *C. tritici* appeared 36 days after the first. In the fields, however, emergence did not begin or end uniformly in all parts. The flight-period was 34–35 days in 1932 and 1933, and 45 in 1934, the period of greatest abundance lasting about 6–10 days. A marked decrease of adults from 4th to 17th June in 1934 is attributed to rain during that time, as the newly emerged midges adhere to the wet soil and die. Both species began flight at the same date, *C. tritici* being predominant for most of the flight-period, and *S. mosellana* at the end of it. The period during which eggs could be deposited varied with different varieties of wheat in the case of *C. tritici*, as its comparatively long, soft ovipositor could penetrate only quite young blossoms with soft glumes. The critical period for hard winter wheat lasted only 5–8 days ; it was about 10–11 days for soft summer wheat. The critical period for *S. mosellana* was longer, as its short, stiff ovipositor could penetrate between the glumes of older blossoms. The males usually remained in the beet fields, though some followed the females to the wheat. A second flight in autumn was not seen [*cf. R.A.E.*, A **20** 485].

In nature rain was required to cause the larvae of *C. tritici* to migrate to the ground. In the author's opinion this was due to a softening of the glumes by absorbtion of water, which reduced the intrafloral pressure and enabled the larvae to reach the upper part of the blossom, where exit through the tip was easy. The larvae of *S. mosellana* migrated in the same manner, but more slowly. By mid-August the blossoms were usually free from both species. Puparia were only observed with *S. mosellana*, which did not, however, pupate in them. It passed a brief portion of its intrafloral life in the puparium and then issued from it in order to migrate from the blossom following rain. In the laboratory, larvae of *S. mosellana* in their puparia could resist dryness for about 2 months, whereas larvae of *C. tritici* perished in about 1 month. Attempts to obtain varieties of wheat forming ears before or after the chief flight-period have been suggested. It is easier to determine the earliest than the latest date of flight, and as in 6 years flight only once began at Alnarp as early as 2nd June, wheat forming ears late in May should escape attack. Even such wheat should have stiff glumes or glumes that soon become stiff.

VAPPULA (N. A.). **Tuholaisten esiintyminen v. 1933.** [The Occurrence of injurious animals in Finland in 1933.]—*Valt. Maatalousk. Tied.* [Bull. Govt agric. Res.] no. 86, 4 pp., 3 maps. Porvoo, 1935.

Pests not mentioned in the previous reports [*R.A.E.*, A **22** 230, etc.] include *Phlyctaenia* (*Pionea*) *forficalis*, L., on crucifers ; *Trachea*

(*Hadena*) *secalis*, L., and *Mayetiola destructor*, Say, on cereals ; *Notolophus* (*Orgyia*) *antiquus*, L., *Amphidasys betularia*, L., *Eriophyes pyri*, Pgst., *E. similis*, Nal., and *Phyllocoptes schlechtendali*, Nal., of which the last is recorded for the first time in Finland, on fruit trees ; *Bryobia praetiosa*, Koch, on gooseberries and currants ; *Eriophyes ribis*, Nal., on black currants ; *Aphis* (*Doralis*) *grossulariae*, Kalt., on gooseberries ; *Cnephasia wahlbomiana*, L., and *Tarsonemus pallidus*, Banks (*fragariae*, Zimm.), on strawberries ; *Byturus tomentosus*, F., in small numbers on raspberries ; *Lygaeonematus* (*Holcocneme*) *erichsoni*, Htg., in two localities on larch ; *Melasoma aeneum*, L., on alder ; and *Phytomyza atricornis*, Mg., on chrysanthemums and *Tetranychus telarius*, L. (*althaeae*, v. Hanst.) on cucumbers, both in greenhouses. *Calandra granaria*, L., *Tribolium* spp., *Laemophloeus* sp., *Ptinus fur*, L., *Oryzaephilus surinamensis*, L., *Tenebroides mauritanicus*, L., *Ephestia kühniella*, Zell., *Tyroglyphus* (*Aleurobius*) *farinae*, DeG., and *Tenebrio molitor*, L., infested stored foodstuffs, and *Attagenus pellio*, L., and *Niptus hololeucus*, Fald., occurred as pests in houses.

[Pokrovskiĭ (E. A.).] **Покровский (Е. А.). Toxikologische Charakteristik arsenhaltiger Präparate.** [Toxicological Characteristics of Preparations containing Arsenic.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 129–140, 1 fig. Leningrad, 1935. (With a Summary in German p. 286.)

In field experiments in Russia in 1932, the toxicity of 30 arsenical dust preparations was tested on *Phyllotreta* spp. and the larvae of various Lepidoptera and of *Athalia rosae*, L. (*colibri*, Christ). The dusts of copper arsenite and other arsenites and arsenates were compared respectively with Paris green (55·5 per cent. As_2O_3 and 30·6 per cent. CuO), calcium arsenite (71·7 per cent. As_2O_3) and calcium arsenate (45·3 per cent. As_2O_5), the average rate of mortality produced by each being calculated as percentage of that produced by the standard to give a toxicity index. The indices for dusts that gave promising results were 97 for copper arsenite containing 48·8 per cent. As_2O_3, 99 for magnesium arsenate containing 28·5 per cent. As_2O_5, and 50 for " Meritol " containing 18·3 per cent. As_2O_5. The copper arsenite scorched foliage less than Paris green, and the other two dusts did not cause injury and adhered well. Of the insecticides mixed with carriers, sodium arsenite containing 30 per cent. As_2O_3 and precipitated on chalk showed an index of 89. A mixture of sodium fluoride and calcium arsenite (9 : 1) was almost as effective as calcium arsenite alone. The dry residue from the manufacture of Salvarsan, which contained 20 per cent. As_2O_5, proved to be an excellent stomach and contact insecticide, having a relative toxicity index of 138.

[Dobrosmuislov (D. I.).] **Добросмыслов (Д. И). Toxizität der Fluor- und Kieselfluorpräparate.** [The Toxicity of Fluorides and Fluosilicates.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 179–184, 6 graphs. Leningrad, 1935. (With a Summary in German p. 288.)

This is a brief account of tests of various fluorides and fluosilicates as stomach insecticides. Following laboratory experiments with cockroaches, plants were dusted in field plots and starved larvae of various Lepidoptera and Coleoptera were placed on the leaves. The rates of application were equivalent to 4½, 9 and 18 lb. per acre. The mean comparative toxicity of the preparations and the exactness of each test were determined statistically, and the results are tabulated. The experiments with Lepidoptera and Coleoptera indicated that the fluosilicates were more toxic than the fluorides, and that of the latter, sodium and manganese fluoride were the most effective. The highest rate of application of the dusts lowered the rate of mortality, probably owing to a repellent action. Magnesium, calcium, barium, and aluminium fluosilicates and manganese fluoride proved to be equal in toxicity to the fluoride and fluosilicate of sodium.

[MASHTAKOV (S. M.) & STRACHITZKIĬ (K. I.).] **Маштаков (С. М.) и Страчицкий (К. И.). Beschädigung der Pflanzen durch Fluor- und Kieselfluorsalze.** [Injury to Plants caused by Fluorides and Fluosilicates.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 184–190, 7 graphs. Leningrad, 1935. (With a Summary in German p. 288.)

The effect of fluorides and fluosilicates on plants was studied in the laboratory by observing the development of the roots of sprouting peas placed in solutions of the salts for varying periods and in the field by spraying plants or branches and calculating the degree of the scorching of the leaves. The concentrations of the salts varied from 0·12 to 4 per cent. The spraying tests were made on fruit trees, raspberry, beans, solanaceous plants and beet. Of these, raspberry was the most susceptible to most of the sprays. The results of the laboratory and field tests agreed completely. In most cases the fluosilicates were more injurious than the fluorides, but the reverse was the case with those of sodium and potassium. The arrangement of the salts in order of decreasing toxicity to plants is as follows : for fluorides, potassium, sodium, aluminium, manganese, magnesium, calcium and barium ; and for fluosilicates, calcium, magnesium, manganese, sodium, aluminium, potassium and barium.

[VEIKHGERTZ (I. S.) & PLETENEVA (N. A.).] **Вейхгерц (И. С.) и Плетенева (Н. А.). Chemisch-physikalische Konstanten einer Reihe von Präparaten.** [Physico-chemical Constants of a Series of Preparations.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 215–226, 1 fig., 11 graphs, 2 refs. Leningrad, 1935. (With a Summary in German p. 290.)

With the view to establishing standards for insecticides and fungicides, a study was made of the physico-chemical properties of 11 different preparations and 6 carriers, the points investigated including size of particles, volume of loose dust, sedimentation, angle of sliding, and the effect of stabilisers on suspensions. Studies of 20 per cent. mixtures of insecticides with carriers showed that the carriers do not act as diluents only, but that a reciprocal action between the particles of the two materials may change the properties of the mixture.

[VEIKHGERTZ (I. S.) & SOKOLOVA (A. V.).] **Вейхгерц (И. С.) и Соколова (А. В.). Untersuchung der Emulsionen vom Phenol-Na-Oleat-Xyloltypus.** [Investigation on Emulsions of the Type of Phenol Sodium Oleate and Xylol.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 227–234, 15 graphs, 10 refs. Leningrad, 1935. (With a Summary in German p. 290.)

Investigations are described on the properties of a mixture consisting of 79·94 per cent. xylol, 12·91 per cent. phenol and 7·15 per cent.

sodium oleate, which with the addition of a small quantity of water turned into a homogeneous liquid. Further gradual addition of water first produced an emulsion with the water in the disperse phase and eventually a very dispersed and stable oil-in-water emulsion. It is pointed out that emulsions containing phenol are made by simple mixing with water, and their preparation does not require special machinery or violent agitation. Special attention was devoted to the mutual reaction of the components of the emulsion. Measurements of the surface tension and electrical conductivity of water solutions of sodium oleate and of phenol separately, and of a mixture of the two solutions, showed that the interchangeable reaction between these substances is negligible, and that the quaternary system, phenol, sodium oleate, xylol, water, may practically be considered as containing four components only.

A study of the stability of emulsions of kerosene and xylol prepared with emulsifiers other than phenol, including sodium oleate and naphthene soap, showed that the emulsion becomes more stable as the concentration of the emulsifier increases, and that the concentration must be high to obtain a comparatively stable emulsion without violent agitation. The increase of the concentration results in the lowering of the surface tension and in a simultaneous decrease of the surface potential. The addition of phenol, however, decreases the surface potential in the presence of even a small quantity of the emulsifier to such an extent that emulsification takes place easily.

[GORYAINOVYI (A. A. & N. S.) & KOBLOVA (F. V.).] **Горяиновы (А. А. и Н. С.) и Коблова (Ф. В.). Arbeiten über Pflanzengifte.** [Work on Vegetable Poisons.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 235–249. Leningrad, 1935. (With a Summary in German p. 290.)

An account is given of tests of the toxicity to leaf Aphids, etc., of preparations from plants that produce alkaloids, chiefly *Anabasis aphylla*, and of investigations on pyrethrum. The methods of analysing plants for the presence of the alkaloids and the technique of testing the insecticidal value of dusts and solutions prepared from such plants are described. The solutions were tested as dips and sprays. Analysis of different parts of *A. aphylla* confirmed the finding that the maximum quantity of alkaloids is in the small green twigs (1·84–2·63 per cent.), whereas the thick green branches contained 0·26–0·41 per cent., and the old woody ones only 0·11–0·23 per cent. [*cf. R.A.E.*, A **21** 579]. The toxicity to Aphids of alkaloids other than anabasine present in *A. aphylla* (aphiline, aphilidine and lupinine) was negligible. It was found that anabasine can easily be extracted with water. Ground plant material containing 2·98 per cent. of the alkaloids placed in water (3 oz. to 5 pints) at 18–20°C. [64·4–68°F.] gave off 2·2 per cent. in 7 hours and 2·7 per cent. in 48; at 70–80°C. [158–176°F.] all the alkaloids passed into the water. In acidified cold water 2·7 per cent. were liberated in 7 hours. A water extract of anabasine was as toxic to Aphids as a solution of anabasine sulphate when the alkaloid contents were about the same. Solutions of anabasine sulphate were not very effective against Aphids when used alone, but were rendered effective by the addition of soap, or cheaper materials, including 0·5 per cent. "Contact" [**20** 200], residue from the manufacture of viscose, lime-sulphur, or milk of lime.

In tests with 5 per cent. anabasine sulphate dusts with a number of carriers, 100 per cent. mortality of Aphids was obtained on the day of the application of dusts mixed with silica gel, carbonates, chalk or limestone. Special experiments showed that dusts prepared with carbonates killed the Aphids in 10–12 minutes, whereas when other carriers were used the insects remained active after an hour. Further tests showed that the effectiveness of inert carriers, such as tripoli or loess dust, can be raised by the addition of at least 15 per cent. of carbonates, such as soda, all the Aphids being killed on the day of the application. Dusts of anabasine sulphate were as effective as the standard nicotine dusts, 100 per cent. mortality being obtained in 10 minutes at 16–17°C. [60·8–62·6°F]. An anabasine dust (named " Aning ") that was as effective as dry anabasine sulphate and is easier to prepare was made by wetting 2 parts finely ground plant material with 1 part water containing 1 per cent. sulphuric acid, and after 5–6 hours mixing it with 4 parts of a carrier, such as limestone powder or equal parts of limestone powder and loess dust.

Of the other plants containing alkaloids, *Veratrum nigrum* showed some toxicity to Aphids, but *Aconitum napellus* was ineffective as a contact poison.

In the investigations on pyrethrum, a new way of preparing pyrethrum dust was found. The ground pyrethrum is soaked for 24 hours in benzene or some other organic volatile solvent, after which a mineral carrier is added and the solvent is almost completely evaporated at the lowest temperature possible. The somewhat damp powder that remains is slightly dried in the air, ground and passed through a sieve of 125 meshes. As a result, a uniform dust (named " Pyring ") is obtained, each particle of which is saturated with pyrethrin ether and also with a small quantity of benzene, which in itself is an insecticide. Only half or a third as much of this dust would be required for a given area as of the ordinary dust of 1 part from ground pyrethrum flowers and 3 parts carrier. In laboratory and field tests " Pyring " mixed with limestone, 1 : 2, and containing 0·1 per cent. pyrethrin I, was effective against a variety of insects.

[Popov (P. V.).] **Попов (П. В.). Zur Methodik der Bestimmung der relativen Toxizität der Insekticiden und im besonderen der Fumiganten.** [Contribution to the Methods of determining the relative Toxicity of Insecticides and particularly Fumigants.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 250–264, 9 graphs, 16 refs. Leningrad, 1935. (With a Summary in German p. 291.)

Insecticides, particularly fumigants, are commonly compared on the basis of one of three factors, dosage, time required to produce mortality or percentage mortality produced, when the other two are constant. The author discusses and recommends mathematical methods of correlating these variables so as to obtain a complete toxicological estimation of a poison.

[Popov (P. V.), Bezzub (K. E.) & Lebedeva (N. I.).] **Попов (П. В.), Беззуб (К. Е.) и Лебедева (Н. И.). Toxizität des reinen Aethylenoxyds und des T-Gases.** [Toxicity of the pure Ethylene Oxide and T-gas.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 264–273, 2 graphs, 29 refs. Leningrad, 1935. (With a Summary in German p. 291.)

General information is given, based on the literature and the authors' investigations, on the properties and effectiveness as fumigants of ethylene oxide and of combinations of this gas with carbon dioxide. Since data on this last point seem to be rather contradictory, special laboratory experiments on *Calandra granaria*, L., were carried out to compare these fumigants with chloropicrin, carbon bisulphide and carbon tetrachloride. The weevils were exposed for 24 hours at 23–24°C. [73·4–75·2°F.] and 50–60 per cent. humidity, and were then placed in test tubes containing wheat grains. The effect of the treatment was estimated by the rate of mortality on the fifth day after fumigation. The curves of toxicity were calculated on the basis of the minimum lethal concentrations by weight and the results are shown in tables. Chloropicrin was 3·7 times as toxic as pure ethylene oxide, and the latter was about 7·7 and 20·4 times as toxic as carbon bisulphide and carbon tetrachloride, respectively. In the mixtures the toxicity of ethylene oxide increased as a larger proportion of carbon dioxide was added to the combination, but only up to the proportion of 10 : 1, at which point maximum toxicity was reached, ethylene oxide becoming 3·7 times as effective as chloropicrin. In mixtures containing carbon dioxide at the rate of 15 : 1 and more, toxicity was practically stabilised at about 3 times that of chloropicrin. When the effectiveness of the fumigants was compared by the index of the toxicity of the molecules, the maximum toxicity of ethylene oxide was again observed in the 1 : 10 combination with carbon dioxide, but in this case it almost equalled chloropicrin in toxicity. With further addition of carbon dioxide the toxicity of the molecule of ethylene oxide decreased and stabilised at 0·90–0·95 of that of chloropicrin. It is concluded, therefore, that for fumigation in practice it is sufficient to use mixtures at rates not higher than 1 : 10–1 : 15, but not less than 1 : 7·5 in view of the inflammability of ethylene oxide.

It was found that with ethylene oxide alone or with the addition of a comparatively small proportion of carbon dioxide, a decrease of the dosage of the fumigant cannot be compensated by a prolongation of the period of exposure, but this was not the case if the proportion of carbon dioxide was high.

Though in the experiments the most toxic of the mixtures was 9–10 times as effective as ethylene oxide alone, in practice the dosages required could only be reduced to $\frac{1}{3}$ or $\frac{1}{4}$ owing to a more intense absorbtion of the gases by the material fumigated.

In the tests most of the weevils died on the day following fumigation, but some survived for 10–15 days ; the effectiveness of the fumigation should therefore not be estimated for at least 2–3 days.

Fumigation with ethylene oxide, alone or with carbon dioxide, greatly reduced the germination of wheat.

[STRACHITZKIĬ (K. I.) & MASHTAKOV (S. M.).] **Страчицкий (К. И.) и Маштаков (С. М.). Zur Methodik der Bestimmung der relativen Toxizität der Insektofungiciden in Bezug auf die Pflanzen.** [Contribution to the Method of Determining the relative Toxicity of Insectofungicides in Relation to Plants.] [*In Russian.*]—*Trans. Inst. Fertil.* no. 123 pp. 273–277, 1 fig. Leningrad, 1935. (With a Summary in German p. 291.)

Since the usual method of investigating the action of insecticides on plants by dusting or spraying the leaves and then determining the degree of scorching often gives unreliable results, a more exact method has been devised. Peas or other plants are grown from seed, and when the roots are 1–2 cm. long, the seedlings are transferred to dishes at the rate of 25 to a dish, the roots being carefully measured. The dishes contain solutions of the insecticides tested and are covered with fabric kept in position with an elastic band and perforated ; the roots are introduced through the holes and are kept in contact with the solutions for periods varying from 15 minutes to 4 hours, after which they are washed and placed in distilled water for two days. They are then examined and their size compared with that of the roots of seedlings in a control dish containing water. Comparative tests described showed that the time taken by an insecticide to stop the growth of the roots was a reliable indication of the degree to which it scorches foliage when applied as a spray or dust.

[Rubtzov (I. A.).] **Рубцов (И. А.). The Distribution of the Reservations of the Siberian Acrididae and the Forecasting of Outbreaks by the Coefficents of Humidity.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 4–24, 1 map, 28 refs. Irkutsk, 1935.

A definite correlation exists between the situation of the " reservations " [*cf. R.A.E.*, A **20** 548 ; **21** 627] of Siberian grasshoppers and the distribution of climate over wide areas, as well as between the periodical outbreaks of grasshoppers and the annual fluctuations in climate. Humidity of the air and of the soil is of the greatest importance, but owing to the interdependence of climatic factors, any single one of them cannot be used to delimit climatic regions. It was found that the known distributions of a number of species correspond most nearly to the regions delimited by lines joining stations with the same aridity index, calculated by means of the formula $\frac{P}{T-36}$ where P is the total precipitation for the year in millimetres, and T is the sum of all temperatures above 0°C. for the six warmer months (April–September) of the year.

The limits of reservations of *Aeropus sibiricus*, L., in which mass outbreaks can occur at different spots almost every year, coincide with the aridity index of 8 ; no outbreaks can occur beyond the area limited by the aridity indices of 12 in the north and 5 in the south.

The reservations of *Chorthippus scalaris*, F. W., and *C. albomarginatus*, DeG., are more northerly and coincide with aridity indices of 10–12, while for *Arcyptera microptera*, F. W., and *Calliptamus italicus*, L., the optimum aridity index is 5. Similar particulars are given for several other species of Siberian grasshoppers, and the different reservations are enumerated and briefly described.

A comparison of the records of previous outbreaks with aridity indices shows that mass appearances of *Aeropus sibiricus* in the reservations occur when the index falls to 8 in any one year, and outside the reservation when such a decrease in aridity occurs for two or more consecutive years.

[Rubtzov (I. A.).] **Рубцов (И. А.). The Changeability of the Environments as a Condition of Outbreaks of the Acrididae.** [*In Russian.*] —*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 25–44, 1 ref. Itkutsk, 1935.

The extremely variable conditions of climate, vegetation and soil in the habitats of injurious Siberian grasshoppers are discussed [*cf.*

R.A.E., A **20** 502 ; **22** 204, 675], and it is concluded that such variability is essential for the mass appearances of the species concerned, which are not numerous, but are ecologically tolerant. Fluctuations in climate, and particularly humidity, are the dominant factors determining the numbers of Siberian Acridids. The effect is indirect, for the light, permeable, slightly saline soils that develop in deforested and overgrazed areas and form the grasshopper reservations, become rapidly dried up and warmed with a decrease in rainfall. The fungi and bacteria, which are the main agents controlling Acridids in the egg-stage, perish, and the resultant large percentage of successful hatchings leads to a mass appearance of grasshoppers.

[Il'enko (M. I.).] **Ильенко (М. И.). Contribution to the Question of the Distribution of the Egg-pods of the Acrididae in different Habitats.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 45–57, 1 ref. Irkutsk, 1935.

In order to find the optimum habitats for egg laying for different species of Acridids, a special study was carried out in the Balagansk district, Eastern Siberia. Sample plots, a quarter of a square metre in size and 5 cms. deep, were taken in different plant associations in grazing fields and hay fields, with considerable populations of grasshoppers, and after they were geo-botanically described, the number of egg-pods in them were counted. It was found that most species of Siberian grasshoppers oviposit in habitats in which they live, except *Aeropus sibiricus*, L., which in dry years may oviposit on field margins and even on ploughed land. The oviposition grounds for each species are characterized by a definite plant community, *e.g.*, *Agropyrum repens*, and *Agropyrum ramosum* and *Festuca ovina* associations for *Aeropus sibiricus* ; *Poa pratensis* and *A. repens* associations for *Chorthippus albomarginatus*, DeG., etc. [*cf. R.A.E.*, A **20** 502]. Within each association, the distribution of eggs is not uniform, most of the eggs being laid on bare patches of ground over ant-hills, and on drier tops of hillocks ; *Chorthippus albomarginatus*, DeG., is exceptional in ovipositing mainly in the more humid lower ground. Very few egg-pods were found in the hay fields. It is suggested that when the ecological peculiarities of oviposition sites of different species are known, it is sufficient to take samples only in characteristic habitats, and thus save a considerable amount of labour during the surveys of the areas infested with eggs.

[Rubtzov (I. A.).] **Рубцов (И. А.). Contribution to the Question of Rationalisation of the Methods of examining Areas occupied by non-swarming Acrididae.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 58–65, 3 refs. Irkutsk, 1935.

The usual method of estimating the importance of the next season's outbreak by means of counting the egg-pods in selected plots in the autumn and spring requires a great deal of labour and does not give reliable results in case of Siberian non-swarming grasshoppers, which infest immense areas and do not oviposit uniformly even in the same habitat [*cf.* preceding paper]. More reliable results can be obtained by calculating the density of the adult populations in different habitats and then estimating the next season's population by considering that a pair produces on the average 3–5 egg-pods, each containing 6–7 eggs.

Such calculations have to be supplemented and corrected by taking samples of egg-pods from characteristic habitats in the autumn and spring [*cf. loc. cit.*], in order to estimate the effect of controlling factors [*cf. R.A.E.*. A **22** 205].

The density of adult population can be approximately estimated by means of sweeping [**21** 51], which is twenty times as rapid as the method of soil samples. The most reliable method, however, is the use of square nets with 28 in. sides, mounted on wooden frames, and subdivided into 4 sections by two boards intersecting in the middle. By placing such a frame over the ground and counting the number of grasshoppers under it, it is possible to obtain the absolute population of grasshoppers per unit of area. The number of such countings per acre will depend on microrelief, and the traverse should include all the different habitats in the studied area.

[RUBTZOV (I. A.).] **Рубцов (И. А.). Pests of the Stems of cultivated graminaceous Plants in Eastern Siberia.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 66–98. Irkutsk, 1935.

Of the pests of cultivated cereals in Eastern Siberia, those that infest the stems are the most important, causing a reduction in crop yield estimated at about 33 per cent. Observations were therefore carried out in 1933–34 in the Irkutsk region on the bionomics of *Phorbia genitalis*, Schnabl, *Oscinella frit*, L., *Mayetiola destructor*, Say, and flea-beetles of the genus *Chaetocnema*.

In some localities during the last few years, *P. genitalis* has infested 70–100 per cent. of the wheat, reduced the crop by half and killed 30–35 per cent. of the infested plants. The adults were on the wing in the second half of May, and mass oviposition occurred between 3rd and 10th June, coinciding with the beginning of tillering and the appearance of the second leaf in early sown summer crops. Oviposition covered a period of about a fortnight, the egg stage lasted 8–9 days, and the larval stage about 2 weeks. Most of the larvae entered the soil for pupation and hibernation about 10th July. The eggs and larvae are described. The eggs are usually deposited inside the sheath of the first leaf of the main stem of sprouting wheat, 5 being the maximum number per plant. The injury caused by the larvae by tunnelling in the central leaf is described [*R.A.E.*, A **2** 350]. Besides wheat, summer rye and occasionally barley were infested. The density of the sowing had no appreciable effect on the intensity of infestation, and as a rule, the plants were attacked before the stage of tillering. The susceptibility of the different varieties of wheat to infestation is discussed. Usually the earlier sown wheat was the more seriously injured. Measures recommended for control are crop rotation, the absence of which has very much favoured infestation, deep autumn ploughing to destroy the pupae, and selection of resistant varieties of wheat and rye.

O. frit occurred in the Irkutsk region, where there are two overlapping generations a year, the larvae of the second hibernating, chiefly in self-sown barley and to a less extent in self-sown wheat. The adults were on the wing from the beginning of June, and mass oviposition occurred in the middle of the month. The first larvae were observed on 23rd June, and the larval stage lasted about 17 days. The first adults of the summer generation emerged in early August. Most of the damage was caused to barley, 100 per cent. of the plants being infested in some localities, whereas wheat and oats were much less injured. In other districts, however, the order of preference was wheat, barley and oats, the respective percentages of infestation being 40–60, 20–35 and 10–20. The susceptibility of different varieties of wheat and barley is briefly discussed. The loss in the yield of wheat caused by the infestation is estimated at 40–60 per cent. Unlike *P. genitalis*, the females chiefly oviposit on secondary shoots, since at the time of oviposition the main stem has become too coarse. In late sown crops, however, the chief stem is attacked, and in general it suffers from *O. frit* more severely than in European Russia, since the plants do not tiller so profusely and fewer additional shoots are available. Crops sown early (between 10th and 20th May) were the least infested.

Mayetiola destructor attacked both barley and wheat, but was much less injurious than *P. genitalis* or *Oscinella*. Oviposition started on 10th June, and the larvae appeared 9 days later; pupation began on 1st July. The stems of cereals were also infested by larvae of *Meromyza saltatrix*, L., *Chlorops taeniopus*, Mg., and an unidentified fly, probably *Crassiseta* (*Elachiptera*) *cornuta*, Fall., which was taken on barley. Adults of *Hylemyia coarctata*, Fall., were numerous on cereals, but its economic importance has not been ascertained.

Of the flea-beetles, *Chaetocnema aridula*, Gyll., and *C. hortensis*, Geoffr., were the most common. Wheat, barley and spring sown rye were the chief crops attacked, and oats but slightly. In 1933, the adults of *C. aridula* were observed on 9th May and mass oviposition occurred at the end of the month. The larvae appeared in mid-June and began to pupate on 10th July. The resulting adults emerged from the end of July. *C. hortensis* developed about a week later. Eggs, usually only one to a plant, were laid both on the main stem and side shoots, often in the parenchyma of the sheath of the first leaf. The larvae mine in the stems, but the central leaf often remains green for a long time, and if the plant is attacked after the formation of 2 or 3 leaves, it may sometimes produce ears, though with light grain. The adults feed on the green leaves of the cereals. The maximum infestation occurred when the plants were in the tube phase of development. The percentage of infestation decreased from 24 in plots sown on 15th May to 2 in those sown on 15th June. It was more severe in low lying places or on heavy soils, but did not appear to be affected by crop rotation. The resistance of the different varieties of wheat and barley is discussed.

[UST'YANTZEV (M. M.).] **Устьянцев (М. М.). Fluorine Preparations in Baits against East Siberian Acrididae.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 204–224, 7 refs. Irkutsk, 1935.

Experiments were made to compare the effectiveness of baits poisoned with different amounts of sodium fluoride and sodium fluosilicate with those poisoned with sodium arsenite. Bait was given to different stages of grasshoppers kept in outdoor cages, as well as to those in the field, where the bulk of the populations consisted of *Aeropus sibiricus*, L. Bran, dried horse dung, and mossy turf from a fir wood were used as bases, the turf proving as hygroscopic and acceptable to grasshoppers as the dung.

In baits containing equal amounts of poison, sodium fluosilicate was as effective as sodium arsenite, and more effective than sodium fluoride. In hoppers up to the third instar, mortality was greatest with baits containing 3 per cent. of their dry weight of the fluosilicate or fluoride ; for fourth instar hoppers and adults 5 per cent. was best. The effectiveness of the fluorine compounds was very dependent on meteorological factors, being greatest at a high temperature and low humidity ; in general they acted more slowly than the arsenite, maximum mortality occurring 7–9 days after the application of the bait. It was found that the amount of sodium arsenite used in the poisoned baits against Siberian non-swarming grasshoppers, which is usually 4 or 5 per cent. of the total dry weight of the bait, can be reduced to 3 per cent. when the air temperature is 24–28°C. [75·2–82·4°F.] and the relative humidity is 60–65 per cent.

[UST'YANTZEV (M. M.).] **Устьянцев (М.М.) Tests with an Alloy of Sodium Fluoride in Baits against Acrididae.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 225–241. Irkutsk, 1935.

Material from which technically pure sodium fluoride is obtained was tested as a poison in baits for grasshoppers in Eastern Siberia. The experiments were made with different stages of grasshoppers in outdoor cages and in the field, where *Chorthippus albomarginatus*, DeG., formed the larger part of the population. The bait was prepared with stable manure, moistened with 1 gal. water to 20 lb. manure and mixed with different amounts of poison, and was broadcast at the rate of 18 lb. per acre. The results were compared to those given by bait poisoned with sodium arsenite (69 per cent. As_2O_3).

Technical sodium fluoride containing 92 per cent. NaF and material containing 32 per cent. NaF were almost equally effective, but neither gave such good results as sodium arsenite. Maximum mortalities of 69 per cent. in the field and 75 per cent. in cages were obtained with a bait containing 5 per cent. of its dry weight of the crude material. The effectiveness of the poison was directly related to meteorological conditions, the percentage mortality rising from 33·7 at 14·5°C. [58·1°F.] and 64 per cent. relative humidity to 46·5 at 23·9°C. [75·02°F.] and 62 per cent. For practical purposes, the bait can be successfully used in areas where vegetation is scarce, provided that the air temperature is above 24°C. [75·2°F.] and the relative humidity below 60–64 per cent.

Preliminary experiments on the control of *Epicauta megalocephala*, Gebl., by dusting the vegetation on which it fed with the crude sodium fluoride material at the rate of 13·5 lb. per acre gave promising results.

[LEVCHUK (Yu. F.).] **Левчук (Ю. Ф.). Contribution to the Study of Noctuids injurious in the East Siberian Region.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 242–277. Irkutsk, 1935.

Cutworms are the chief pests of vegetables in Eastern Siberia, destroying annually 15 per cent. of the seedlings. A list is given of the 14 species observed, chiefly in the Department of Irkutsk. They include, in addition to those already noticed [*R.A.E.*, A **16** 296 ; **19** 80], *Agrotis occulta*, L., *Feltia* (*Agrotis*) *exclamationis*, L., and *Euxoa corticea*, Schiff., which have not previously been recorded as injurious in Eastern Siberia ; and *Euxoa arenacea*, Kozh., *E. tritici*, L., *Agrotis fennica*, Tausch., and *A. squalida*, Gn., which are recorded as pests for the first time in the Russian Union. The relative importance of the species varies in different years. In the environs of Irkutsk *E. corticea* predominated in 1931, *E. islandica*, Stgr., in 1932, and *A. fennica* in 1933. The cutworms are injurious from May to mid-July and attack a wide range of cultivated plants and weeds. All species produced only one generation a year, and all except *E. islandica* hibernated as larvae.

The adults of *E. corticea*, all stages of which are described, were on the wing from 24th June to 15th August. The females emerged with well developed ovaries and a large reserve of fat, but the rate of oviposition probably depends on nutrition, as in the insectary those fed on sugar syrup or honey laid eggs 5–9 days after emergence, whereas those deprived of food did so only after 10–15 days and soon died. The average number of eggs laid by a female was 468, in 6–11 days. The egg stage averaged 12 days at 17°C. [62·6°F.] and 16·8 days at 15·9°C. [60·6°F.]. The larvae pass through six instars ; in the first two they live on the surface of the soil in cracks or under dry leaves, but subsequently keep in the soil at a depth of 1–2 cm. and feed chiefly at night. In the spring, overwintered larvae were found in the field about the middle of April at a mean day temperature of 4–5°C. [39·2–41°F.]. At first they fed on weeds, but as soon as the vegetable seedlings were planted out they migrated to them, probably because most of the weeds had been destroyed by ploughing for the crop. They were most active in the first three weeks of June. They pupated in the soil, the prepupal stage lasting 5–9 days and the pupal 25–31.

The adults of *E. islandica*, all stages of which are described, were on the wing from 18th July till 13th August in 1932 and from the 21st July till 23rd August in 1933. In the insectary, females fed on honey began to oviposit 19–22 days after emergence. The oviposition period lasted 9–15 days and the average number of eggs laid was 489. Insectary observations indicated that *E. islandica* probably hibernates in the egg stage, as eggs under conditions of outdoor temperature did not hatch till spring and were very resistant to cold. In the field, most of the larvae were in the second and third instars in the second half of May, and in the fifth and sixth in the second half of June. The prepupal and pupal stage in the soil together averaged 34–35 days.

The flight period of *A. fennica* in 1931 and 1932 lasted from 9th–10th July to the 2nd–3rd September. Oviposition started 10–13 days after emergence, and the number of eggs laid by a female averaged 764. They hatched in 31–40 days. In 1933 the overwintered larvae appeared on the surface of the soil in the second half of April. They are very active and climb on to plants to a height of 2–4 ins. They were injurious from mid-May to about 20th June, and, unlike the two species of *Euxoa*, feed on the leaves, spending their life above ground. Pupation took place in the second half of June, the prepupal and pupal stages together lasting about a month.

Cutworms were less numerous during 1931–33 than in previous years, probably owing to rainy summers and cold springs. The parasites reared were : the Braconid, *Rhogas eurinus*, Kok., and the Ichneumonids, *Amblyteles erythrocephalus*, Meyer, and *A. uniguttatus*, Grav., all from pupae of *E. islandica* ; *A. infractorius*, L., from pupae of *E. islandica*, *E. arenacea* and *A. fennica* ; *Ophion* sp. and Tachinids from pupae of *A. fennica* ; and the Encyrtid, *Litomastix* (*Copidosoma*) *truncatella*, Dalm., from larvae of *Euxoa* spp. A list of parasites of cutworms observed in the Russian Union since 1926, showing the host and year of breeding, is given.

The measures recommended include destruction of weeds, ploughing to destroy the young larvae, and broadcasting poisoned bran bait before planting vegetables.

[KACHAEVA (Z. F.) & RUBTZOV (I. A.).] **Качаева (З. Ф.) и Рубцов (И. А.). Geobotanical Description of the Reservation Areas of Acrididae in the Balagansk Steppe.** [*In Russian.*]—*Trud. Zashch. Rast. Vost. Sibiri* no. 2 (4) pp. 278–288, 1 map, 1 ref. Irkutsk, 1935.

In the Balagansk steppe, Eastern Siberia, where the most dangerous grasshopper reservations are situated, it was found that in different habitats a decrease in the number of species and an increase in numbers of individuals of grasshoppers were parallel to a decrease in the number of species in plant associations and in the percentage of plant cover. The maximum numbers occur in the association of *Agropyrum cristatum* and *Urtica* sp., with its amorphous, dust-like soil, which develops in waste places round human habitations; here the density of the grasshopper population, which consists almost entirely of *Aeropus sibiricus*, L., and *Chorthippus albomarginatus*, DeG., reaches up to 45–270 per square yard.

DESHUSSES (J.) & DESHUSSES (L.). **Présence de *Ceratitis capitata*, Wied., diptère nuisible aux cultures fruitières, dans la région de Genève.**—*C. R. Soc. Phys. Hist. nat. Genève* **52** no. 3 pp. 201–203, 9 refs. Geneva, 1935.

Larvae of *Ceratitis capitata*, Wied., which had not previously been recorded in Switzerland, were found in 1935 in apricots on trees grown in the open near Geneva, and also in figs said to have been imported from France. Thus the infestation of the apricots may have been due to the Trypetid having been imported in infested fruit, or possibly to its having spread up the Rhône valley from France. In the area round Lyons it caused severe damage to peaches in 1928 and 1929.

DESHUSSES (J.) & DESHUSSES (L.). **Insectes nuisibles de la Suisse, essai d'une statistique.**—*C. R. Soc. Phys. Hist. nat. Genève* **52** no. 3 pp. 203–206. Geneva, 1935.

From a survey of the literature and their own experience, the authors find that the number of species of insects known to cause economic damage to plants in Switzerland in 348. They give tables showing the numbers that belong to each of the six orders concerned and the numbers that attack the main groups of crops (vegetable, ornamental, field, fruit and forest), as well as a list under groups of crops of a few of the more injurious species.

VOELKEL (—) & KLEMM (—). **Die wichtigsten starken Schäden an Kulturpflanzen im Jahre 1935.** [The chief severe Injuries to cultivated Plants in 1935.]—*NachrBl. dtsch. PflSchDienst* **16** nos. 1–3 pp. 5–10, 17–22, 27–34, 4 graphs, 39 maps. Berlin, January–March 1936.

Records of insect pests from various localities in Germany constitute a large part of this list.

ZACHER (L.). **Wie macht sich der Messingkäfer bemerkbar?** [How does *Niptus hololeucus* make itself noticed?]—*Mitt. Ges. Vorratsschutz* **12** no. 2 pp. 15–19, 6 figs. Berlin, March 1936.

The author summarises existing information on the bionomics and control of the Ptinid, *Niptus hololeucus*, Fald., in Germany [*R.A.E.*, A **16** 375; **18** 152; **19** 20, etc.], where it has caused considerable harm to textiles, yarn and leather goods, and also infests old bread, bran, cacao powder, etc. The larvae cannot thrive on starchy food without the addition of albuminous material, such as dead insects. The adults are especially harmful to fabrics.

ZACHER (F.). **Ein eingeschleppter Holzschädling,** *Xylobiops basilare* **Say.** [An introduced Wood-pest, *X. basilare*.]—*Ent. Rdsch.* **53** no. 19 pp. 256–258, 2 figs. Stuttgart, 1st April 1936.

The author received from Hamburg a piece of wood, probably of *Diospyros virginiana*, imported from America and containing an adult and larvae of *Xylobiops basilare*, Say. The adult bores through the bark and tunnels closely under it in the sapwood, ovipositing in the galleries. This Bostrychid sometimes causes severe damage to the wood of hickory and persimmon, from which bobbins, mallets, etc., are made.

BAKÓ (G.). **Die landwirtschaftliche Entomologie in Ungarn.** [Agricultural Entomology in Hungary.]—*Arb. physiol. angew. Ent. Berl.* **3** no. 1 pp. 21–25. Berlin, 18th March 1936.

Notes are given on the origin and development of organised work on agricultural entomology in Hungary and on the main pests that have been dealt with.

MENOZZI (C.). **La campagna saccarifera 1935 nei riguardi delle infestioni entomatiche.** [The Sugar-beet Season in Italy in 1935 as regards Infestation by Insects.]—*Industr. saccar. ital.* **29** no. 2 reprint 8 pp., 4 figs. Genoa, February 1936.

Insect pests were active in Italy during the sugar-beet season in 1935 owing to the dry weather and the preceding comparatively mild winter. *Cleonus* (*Conorrhynchus*) *mendicus*, Gyll., caused more injury than in 1934 [*R.A.E.*, A **23** 160], but control measures gave satisfactory results where they were properly applied. Parasites were ineffective except in Rieti, where the Tachinid, *Rondania dimidiata*, Mg., attacked up to 65 per cent., justifying the advice given there to delay artificial control until it had developed. In Cecina many larvae were parasitised by the Nematode, *Neoaplectana menozzii*, Travas. Against the Halticid, *Chaetocnema tibialis*, Ill., which was fairly harmful, a proprietary dust containing rotenone gave excellent results at the rate of about 7 lb. per acre when applied with a hand duster. The losses due to *Cassida vittata*, Vill., and *C. nobilis*, L., were negligible, owing to their being controlled early by *Trichogramma evanescens*, Westw., *Tetrastichus bruzzonis*, Masi, and *Brachymeria vitripennis*, Först. *Pegomyia hyoscyami*, Panz., *Gryllulus* (*Gryllus*) *desertus*, Pall., and *Gryllotalpa gryllotalpa*, L., did little harm. Against *Lixus junci*, Boh., infesting seed beet, 3,000 bred individuals of *Glyptomorpha castrator*, F., *Picroscytoides cerasiops*, Masi, *Arthrolysis* (*Picroscytus*) *scabricula*, Nees, *Eurytoma curculionum*, Mayr, *E. tristis*, Mayr, and the Tachinid, *Nyctia halterata*, Panz., were liberated and this work is to be continued. Seed beet was also infested by *Phthorimaea ocellatella*, Boyd, which appears to have 3 generations a year in the centre of Italy and 2 in the north. The larvae are parasitised by the Braconids, *Apanteles albipennis*, Nees, *Agathis tibialis*, Nees, and *Chelonus* (*Chelonella*) *contractus*, Nees. Old beets were successfully treated against this Tineid by fumigating them for 8–10 hours in a small cabin with carbon bisulphide at the rate of about 6 oz. per 100 cu. ft.

SALT (G.). **Miscellaneous Records of Parasitism.—II.**—*J. Soc. Brit. Ent.* **1** pt. 5 pp. 125–127, 2 refs. Southampton, 24th March 1936.

Of over 700 puparia of *Phorbia genitalis*, Schnabl, collected in the soil about the roots of wheat stubble in Hertfordshire, 24 were parasitised by the Ichneumonid, *Hemiteles subzonatus*, Grav., 10 by the Braconid, *Phaenocarpa pullata*, Hal., and 2 by the Pteromalid, *Arthrolytus maculipennis*, Wlk. (*punctatus*, Thoms.), which are all apparently primary parasites.

In the late autumn of 1929 a number of cocoons of *Pteronus* (*Pteronidea*) *salicis*, L., were collected from the soil at the base of a willow tree in Bedfordshire. The 153 adults that emerged comprised 102 *Pteronus*, 24 *Mesoleius segmentator*, Hlmgr., 15 *Mesochorus dimidiatus*, Hlmgr., 4 *Holocremnus clandestinus*, Hlmgr., 1 *Enicospilus ramidulus*, L., 1 *Ophion luteus*, L., 5 *Microcryptus micropterus*, Grav., and 1 *M. nigrocinctus*, Grav. With the exception of *M. segmentator*, these parasites are recorded for the first time from *P. salicis*.

ANDREWES (H. L.). **Honey-combs as a Bait for Moths.**—*J. Soc. Brit. Ent.* **1** pt. 5 pp. 141–145. Southampton, 24th March 1936.

A list is given of some 80 species of moths that were taken on honeycombs, from which the honey had recently been extracted, hung on wire-netting round a garden in Dorset between 1st September and 18th October 1935.

BOYD (D. O.) & HODSON (W. E. H.). **Transference of a Mite from Cyclamen to Strawberry.**—*Nature* **137** no. 3466 p. 581, 3 refs. London, 4th April 1936.

In experiments at Reading *Tarsonemus pallidus*, Banks, from *Cyclamen* was established on strawberry [*cf. R.A.E.*, A **23** 243]. In November 1935, flowers from an infested *Cyclamen* were placed on the crown of a strawberry plant, and in January 1936 adult mites were present inside the crown and between the folds of the young leaves. The plant showed symptoms typical of *Tarsonemus* damage.

Heather Beetle.—*The Field* **167** no. 4350 p. 1056. London, 9th May 1936.

Since 1915 the Galerucid, *Lochmaea suturalis*, Thoms. [*cf. R.A.E.*, A **17** 163 ; **24** 63], has been increasing in numbers in Scotland, Wales, northern England and even Devonshire, large patches of heather (*Calluna vulgaris*) being eaten to the bare stems. The beetles hibernate in the soil at the roots of the plants and emerge to pair in April–May. The eggs are laid on sphagnum moss, and the larvae make their way to neighbouring heather on which they feed till August or September, when they leave the plants to pupate. The adults emerge in the autumn and remain on the wing for a few days before hibernating. Control is only possible in the summer and early autumn when the larvae can be destroyed by burning the heather. In Scotland, however, the law prohibits the burning of heather except within a specified period in early spring. It is suggested that this law must be altered, since the threat to the heather and the grouse which feed on it has become so extensive.

King (K. M.), Arnason (A. P.) & Glen (R.). **The Wireworm Problem in Field Crops of western Canada.**—*Saskatoon Leafl. ent. Br. Dep. Agric. Canada* no. 35, 22 pp. multigraph. Saskatoon, Sask., December 1935. [Recd. April 1936.]

This leaflet, which has already been noticed [*R.A.E.*, A **23** 310], is now issued with a supplementary page on the value of summer-fallowing for reducing infestation of cereals. It was found that clean summer-fallowing every third year during June and July reduced the number of wireworms by at least one-half in field plots after the soil had been summer-fallowed twice.

Edwards (W. D.), Gray (K. W.), Willcox (J.) & Mote (D. C.). **The Blackberry Mite in Oregon** (*Eriophyes essigi* **Hassan**).—*Sta. Bull. Ore. agric. Exp. Sta.* no. 337, 33 pp., 13 figs., 21 refs. Corvallis, Ore., June 1935. [Recd. April 1936.]

An account is given of experiments from 1930 [*R.A.E.*, A **20** 279] to 1934 on the control of *Eriophyes essigi*, Hassan, on blackberries in Oregon [*cf.* also **21** 539]. The following programmes are recommended: a spray of lime-sulphur or 3 per cent. summer oil (viscosity 55–70 secs. Saybolt and 90 per cent. unsulphonated residue) applied in autumn after the old canes have been removed or a dormant spray of lime-sulphur applied in spring after the new canes have been trained and shortly after the buds begin to grow, followed in each case by a delayed dormant spray of lime-sulphur when the new growth is 2–6 ins. long. For all the lime-sulphur sprays 8 gals. (30°Bé) is used to 92 gals. water. The delayed dormant spray alone may be sufficient if the mites have been controlled satisfactorily in previous seasons. As an emergency measure when no sprays have been applied previously, 3 per cent. summer oil should be used at the rate of about 500–750 U.S gals. per acre after 90 per cent. of the fruit is set. Complete control cannot be expected, however. The autumn and dormant sprays should be applied at the rate of 175–250 U.S. gals. per acre and the delayed dormant spray at 225–300 U.S. gals.

The pre-blossom spray of wettable sulphur recommended in 1930 [**20** 280] has caused scorching of the foliage and a reduction in yield during the past 3 seasons.

Watson (J. R.). **The Pepper Weevil in Florida.**—*Pr. Bull. Fla agric. Exp. Sta.* no. 479, 2 pp. Gainesville, Fla, September 1935. [Recd. April 1936.]

In the spring of 1935, *Anthonomus eugenii*, Cano, was found in every field of peppers [*Capsicum*] examined in one county in Florida. In one field it was destroying the crop as quickly as it developed, but in others, particularly where the peppers were young, the damage it caused was not so severe. Brief notes are given on its bionomics, with suggestions for its control, on the basis of work in California [*cf.* *R.A.E.*, A **23** 109, etc.].

SEVERIN (H. C.). **The Common Black Field Cricket. A Serious Pest in South Dakota.**—*Bull. S. Dak. agric. Exp. Sta.* no. 295, 51 pp., 19 figs., 8 refs. Brookings, S. Dak., December 1935. [Recd. April 1936.]

An account is given of the bionomics and control of the common black field cricket, *Gryllulus* (*Gryllus*) *assimilis*, F., in South Dakota [*cf.* *R.A.E.*, A **14** 284], where it is an important pest of field crops and also occurs in houses, damaging textiles, etc. Crickets that have hibernated in the egg stage become adult in July and August. In cages the preoviposition period varied from 6 to 30 days. Crickets usually laid about 150–400 eggs singly in the soil ; 50 or more may be deposited in 4 sq. ins. of soil. Experiments showed that although the depth at which the eggs were buried seemed to have no effect on their hatching, the percentage of vermiform larvae that reached the surface of the soil became smaller as the depth increased. The vermiform larvae moult when they reach the surface, after which crickets pass through 8 or 9 nymphal instars, all of which are described. The crickets matured in 65–102 days, mostly in 78–90 days. Adults lived 50–60 days in cages but probably less in the field. Unpaired females laid as many eggs as paired ones but they were sterile. In rearing experiments cannibalism occurred when crickets were fed on lucerne only. The best control of the nymphs and adults is given by baits of 100 lb. coarse bran, 1½ U.S. gals. low grade cane molasses, 10–12 U.S. gals. water, and 5 lb. sodium fluosilicate or crude white arsenic, applied at the rate of 20 lb. per acre. The bait should be distributed in the late afternoon [*cf.* **14** 285], preferably after irrigation or rain. For the control of crickets in buildings pyrethrum dust, or dusts of sodium fluosilicate or sodium fluoride are effective [*cf.* **20** 641].

Natural enemies include the Scelionids, *Caloteleia* (*Ceratoteleia*) *marlatti*, Ashm., and *Paridris brevipennis*, Fouts, which parasitise the eggs. From 20 to 50 per cent. of the eggs are destroyed each year by the former, and from 1 to 5 per cent. by the latter.

HARMAN (S. W.). **Spray Residue as Related to Codling Moth Control.**—*Proc. N.Y. St. hort. Soc.* **81** pp. 40–51. Le Roy, N.Y., 1936.

In eastern New York the residues from the sprays against codling moth [*Cydia pomonella*, L.] on apples are kept below tolerance by the substitution of calcium arsenate for lead arsenate in some of the cover sprays [*cf.* *R.A.E.*, A **23** 322]. In western New York from 3 to 6 lead arsenate cover sprays are necessary according to the degree of infestation. Tests show that the residue increases from 0·003 to 0·074 and 0·116 grains of arsenic per lb. fruit as the number of cover sprays is increased from 0 (calyx spray only) to 5 containing 3 lb. lead arsenate, and 5 containing 6 lb. lead arsenate respectively ; the corresponding figures for lead residues are 0·009, 0·172 and 0·274 grains. It is necessary to wash fruit receiving more than the calyx and 1 cover spray. Types of washing machines are discussed ; dry brushing machines are only suitable for deposits very near tolerance, flotation washers are satisfactory for residues left by lead arsenate used at the rate of 3 lb. per 100 U.S. gals. in cover sprays, and flood-type washers with brushes will remove deposits left by lead arsenate of greater strength or in combination with oil. Sodium silicate, heated to 110–120°F., may be used for the washing solution for waxy or oil-sprayed fruit, but 0·5–1·5 per cent. hydrochloric acid solution, according to the amount of deposit, is better adapted for use under New York conditions, as it is more efficient in reducing spray deposits of lead arsenate and fungicides used with lime. The heaviest residues found in the State were removed by 1·5 per cent. hydrochloric acid in a flood type washer with brushes at 85–90°F., and experiments showed that wetting agents had little effect in increasing the efficiency of this solution. The danger of injury to the fruit increases rapidly with temperatures above 90°F.

Robinson (R. H.) & Hatch (M. B.). **Spray Residue Information for the Orchardist and Fruit Packer.**—*Sta. Bull. Ore. agric. Exp. Sta.* no. 341, 22 pp. Corvallis, Ore., August 1935. [Recd. April 1936.]
Robinson (R. H.). **Spray Residue on Apples. Supplementary Solvents for its Removal.**—*Industr. Engng Chem.* **28** no. 4 pp. 455–457, 1 fig., 4 refs. Easton, Pa, April 1936.

In view of the reduction of lead tolerance for 1935 to ·018 grains per lb. fruit and the probability of further reductions, procedures by which apples and pears may be freed from lead arsenate spray residue are described on the basis of experience in Oregon [*cf. R.A.E.*, A **22** 183]. In general, pears are easier to clean. The averaged results of a few of numerous experimental and packing-house washing tests are reported. Every attempt should be made to reduce populations of *Cydia pomonella*, L., by a more thorough application of fewer but more carefully timed sprays, substituting calcium arsenate for lead arsenate where possible. In order to avoid complication by the formation of natural wax, apples should not be left for several days in the orchard or in storage between picking and washing. Varieties of apples known to form wax before or soon after harvest should be picked in good time and washed first. The removal of spray residues is also complicated by the application of oil sprays too near harvest time.

The action and effectiveness of various washing solvents and combinations when used in single and dual process flood-type machines are discussed. A 1·0 per cent. solution of hydrochloric acid with the addition of about 15 lb. salt is equivalent to a 1·5 per cent. solution of the acid alone, but no beneficial action is imparted to the acid for cleaning residues protected by wax or oil. Wetting agents (Vatsol, Hydralene, Areskap and Lethalate) in some cases aid materially in the removal of residues. They are most effective when used in flotation type washers where the fruit is retained in the solvent for one minute or more. In commercial flood or spray type washers where the fruit is exposed to the acid for 20–40 seconds, excessive foaming occurs if more than ½ lb. wetting agent to 100 U.S. gals. acid is used. Defoaming compounds counteract the beneficial action of the wetting agent. From 2 to 4 lb. wetting agent to 100 U.S. gals. acid solution should be sufficient to clean waxy or heavily sprayed fruit, but if picking has been delayed or the fruit allowed to stand in boxes for several days, the use of 8 lb., or heating of the solution may be necessary. A combination of hydrochloric acid and petroleum oil was the only solvent mixture that effectively cleaned the worst lots of apples. Oils of high purity having a viscosity of 40–55 seconds Saybolt should be used. Kerosene, a very light oil of 25 seconds viscosity, also cleans well but volatilises rapidly at higher temperatures. The best results are obtained when the oil is used without an emulsifier in flood-type washers, but it must be emulsified in spray-type machines and pre-dipping tanks. As emulsification ties up the oil and reduces its effectiveness, a quick-breaking emulsion should be used in these cases, and better results are obtained if some kind of agitator is inserted into the tank to ensure rapid circulation. Oil may be used at the rate of 1, or in severe cases 2, gals. to 100 gals. of the acid solution, and the temperature should be kept between 90 and 105°F. When oil is used in a dual process washer, the rinse water also should be warm. In a few tests the results obtained in a dual process washer where sodium silicate was used in the first unit and acid in the second were better without the addition of oil. The oil may also retard the solvent action of acid where little or no wax has formed on the surface of the fruit, and should only be used in cases where there is a heavy coating of wax, mineral oil or fish-oil. It should not be used for pears, and calyx injury may result to apples if washed with the acid-oil combination when they are already past their prime.

Sodium silicate is effective in removing spray residues embedded in natural wax or fish-oil residue, a large portion of which is removed by detergent as well as by solvent effect. It should be used at temperatures over 90°F., and under violent agitation. About 75 lb. sodium silicate to 100 U.S. gals. should be sufficient. If either Bordeaux mixture or lime has been used in combination with lead arsenate, fruit should be washed in acid or put through an acid dip to remove these deposits before it enters the silicate wash, or in the case of a dual process washer, acid should be used in the first unit and silicate in the second. The addition of soap or a wetting agent to sodium silicate improves its cleaning properties, but the addition of oil is of no value. Somewhat better cleaning is obtained by the addition of 20 lb. salt to 100 U.S. gals. sodium silicate wash, but a wetting agent should be used instead of soap to produce foaming. Flood-type machines are the most efficient washers, and the addition of brushes increases their efficiency, though in many districts the flotation type paddle washer in which the fruit is conveyed slowly through the solvent by means of dipping paddles does the work satisfactorily. The superiority of the dual-process machine, which permits of the use of two different solvents in the two separate washing units, has been demonstrated.

Methods for determining the most effective solvent for cleaning fruit grown under prevailing conditions in each locality are outlined, with notes on the degrees of difficulty in cleaning different types of fruit. Information is also given on the operation of a home-made flotation washer, together with methods for determining the strength of acid and sodium silicate solutions.

The second paper deals primarily with the removal of residues with hydrochloric acid to which petroleum oil or wetting agents have been added, the information given being similar to that in the first.

TUCKER (R. P.). **Oil Sprays. Chemical Properties of Petroleum Oil Unsaturates causing Injury to Foliage.**—*Industr. Engng Chem.* **28** no. 4 pp. 458–461, 6 refs. Easton, Pa, April 1936.

An account is given of experiments to determine why the unsaturated hydrocarbons of petroleum oils are toxic to foliage. Apricot leaves were used for the tests. The results indicated that the hydrocarbons of petroleum oils are not toxic to foliage until they are oxidised to oil-soluble asphaltogenic acids. The unsaturated hydrocarbons are, therefore, by themselves no more toxic to foliage than the saturated ones. The rate of oxidation of the saturated oils at ordinary temperatures is so slow that they are chemically inert towards foliage. The rate of oxidation of oils containing appreciable amounts of unsaturated hydrocarbons is also very slow in darkness. Sunlight, however, markedly activates the oxidation, and the rate of formation of the toxic acids apparently becomes greater than can be tolerated by the foliage. The amount of asphaltogenic acids that an oil must contain in order to be injurious to foliage is relatively small. Oils containing less than 0·4 per cent. of these acids, irrespective of the percentage of unsaturated hydrocarbons present, did not injure leaves kept in the dark, but others containing 0·7 per cent. produced noticeable injury. The toxic threshold for apricot leaves is therefore about 0·5 per cent. acids. Although this figure may differ according to the kind of foliage, it is apparently always small. Oxidation tests carried out under conditions of moisture and light somewhat comparable to those found in leaves indicated that the formation of asphaltogenic acids is roughly proportional to the percentage of unsaturated hydrocarbons present in an oil. All oils with the same unsulphonated residue, that is, the same amount of unsaturated hydrocarbons, would not necessarily be equally resistant to oxidation in the presence of light. A test whereby petroleum oils to be used for spraying foliage could be examined as to their relative resistance to oxidation in the light would therefore appear to be of value.

FLINT (W. F.) & FARRAR (M. D.). **The Use of Nicotine in the Apple Spray Schedule.**—*Trans. Ill. St. hort. Soc. 1935* **69** pp. 167–174, 1 ref. Salem, Ill., 1936.

Brief notes are given on the use of nicotine in programmes for spraying apples in Illinois. Nicotine sulphate against Aphids has been replaced by dormant or delayed dormant sprays of tar distillates. Leafhoppers can be controlled by ¾ pt. nicotine sulphate in 100 gals. water, with oil, soap or other spreader. It should be applied with the first or second cover spray if there are more than 50 nymphs to 100 leaves. For late apples, sprays of lead arsenate in the calyx, first and second cover sprays followed by sprays containing 3 qts. summer oil and 1 pint nicotine sulphate to 100 gals. water will control the codling moth [*Cydia pomonella*, L.] and the residue of lead and arsenic will usually be below tolerance, while for early apples sprays containing 1 pint nicotine sulphate and ½ per cent. summer oil, the first applied 18–20 days after the calyx spray, are sufficient. Promising results have been obtained in preliminary experiments with nicotine bentonite, but with nicotine tannate the results were disappointing. Nicotine-oil combinations kill codling moth eggs, and also any adults that may be in the orchard.

CHANDLER (S. C.) & FLINT (W. P.). **The Latest Methods of Fighting the Oriental Fruit Moth.**—*Trans. Ill. hort. Soc. 1935* **69** pp. 485–493. Salem, Ill., 1936.

During 1935, the average infestation of peaches by the oriental fruit moth [*Cydia molesta*, Busck] in different areas in southern Illinois varied from 4·5 to 76 per cent. Collections of infested twigs were made from 20 orchards where *Macrocentrus ancylivorus*, Rohw., had been liberated. Of the 1,034 larvae of *C. molesta* reared, 17·7 per cent. were parasitised by 9 parasites, and 61 per cent. of this parasitism was by *M. ancylivorus*. In orchards 2 and 3 miles distant from the points of liberation of *M. ancylivorus* 72 and 60 per cent. respectively of the larvae were parasitised by it. In experiments on the control of *C. molesta* with oil-impregnated dusts, the composition of which is not stated [*cf. R.A.E.*, A **22** 357], applications were made on 29th April, 15th May, 8th and 20th July and 2nd August. Two treatments of oil-dust with lead arsenate at the rate of ½ lb. per tree applied to one side only, gave 46·4 per cent. control when followed by 3 oil-dusts (without lead arsenate) applied at the same rate and in the same manner, and 48·1 per cent. control when followed by oil-dusts at the rate of 1 lb. per tree applied to both sides. Two sprays of lead arsenate, lime and zinc sulphate, followed by 3 oil-dusts with derris at the rate of 1 lb. per tree applied to both sides gave 37·9 per cent. control. The addition of derris did not improve the dusts. Other recommendations for control include the use of bait traps for information about the emergence of the adults, and the removal of late varieties of peach trees, in which a greater proportion of larvae hibernate. Peach should not be interplanted with apple, since each tends to increase the infestation on the other.

BARBER (G. W.). *Orius insidiosus* **(Say), an important Natural Enemy of the Corn Ear Worm.**—*Tech. Bull. U.S. Dep. Agric.* no. 504, 24 pp., 50 refs. Washington, D.C., January 1936. [Recd. April 1936.]

An account is given of the work on *Orius insidiosus*, Say, an important predator of the eggs and newly hatched larvae of *Heliothis armigera*, Hb. (*obsoleta*, F.), carried out at Richmond, Virginia, during 1928–1929. This Anthocorid occurs throughout most of the United States and in southern Canada, and attacks many pests, particularly those that infest maize. Thus it has been observed by the author to destroy *Pyrausta nubilalis*, Hb., in Massachusetts, *Laphygma frugiperda*, S. & A., in Georgia and *Diatraea crambidoides*, Grote, in Virginia. It passes the winter as an adult in protected places [*cf. R.A.E.*, A **18** 489], and is found on flowers in small numbers from March to May or June, congregating on maize in July when the plants are about 1 ft. high. The eggs, which are laid singly, generally on the moist fresh maize silks, hatch in 3–4 days. The nymphal stage occupies about 15 days The nymphs feed at first on the moist silks, but in later instars prefer insect food. The length of life of the adults varies with the food ; when fed on *Heliothis* eggs and newly hatched larvae, they lived long and deposited eggs over long periods, a few at a time. Females laid an average of 114 eggs. Adults receiving no animal food had short lives and laid no eggs. Nymphs occurred principally when the maize plants were in silk, and adults on plants that had young tassels or were in silk. Four generations a year seem to be possible in Virginia, but 2 or 3 are probably more common. The life-cycle may occupy 24 days. In central Virginia *Orius* destroyed an average of 38·47 per cent. of *Heliothis* eggs on maize plants over a period of several years. The percentage destroyed varied in different years and at different times during the season. It was highest among eggs deposited on silks and when other food, including Aphids and thrips, was not available.

McKenzie (H. L.). **Say's Plant Bug,** *Chlorochroa sayi* **Stål, on Beets in California.**—*Pan.-Pacif. Ent.* **12** no. 1 p. 18. San Francisco, Calif., January 1936.

Adults of *Chlorochroa sayi*, Stål, were observed on beets grown for seed in California in June 1935, but had infested the plants too late in the season to cause any apparent damage to the developing seeds. This Pentatomid had not previously been recorded on beet.

Spraying Program and Pest Control for Fruit Crops.—*Bull. Ohio agric. Exp. Sta.* no. 562, 48 pp., 22 figs. Wooster, Ohio, February 1936.

This bulletin contains spray programmes against pests and diseases of apples, pears, peaches, plums and sweet cherries, sour cherries, grapes, gooseberries and currants, strawberries, and raspberries and blackberries in Ohio, followed by notes on the ingredients, preparation and application of the sprays, and on the treatment of peach trees with paradichlorobenzene against the peach borers [*Aegeria exitiosa*, Say, and *A. pictipes*, G. & R.].

Johnson (J.). **Tobacco Streak, a Virus Disease.**—*Phytopathology* **26** no. 3 pp. 285–292, 3 figs., 9 refs. Lancaster, Pa, March 1936.

When investigating the transmission of the virus of a disease of tobacco in Wisconsin, for which the term " tobacco streak " is proposed, the author made a limited number of tests with *Myzus persicae*, Sulz., *Macrosiphum solanifolii*, Ashm., *M. solani*, Kalt. (*Myzus pseudosolani*, Theo.), *Trialeurodes* (*Aleyrodes*) *vaporariorum*, Westw., *Thrips tabaci*, Lind., *Empoasca fabae*, Harr., and an undetermined greenhouse thrips. The results indicated that these insects were not vectors.

Bowen (M. F.). **A Biometrical Study of two morphologically similar Species of** *Trichogramma.*—*Ann. ent. Soc. Amer.* **29** no. 1 pp. 119–125, 4 figs., 8 refs. Columbus, Ohio, March 1936.

The two strains or physiological species of *Trichogramma* used in this study were one from Massachusetts, in which the general colour of the female was light yellow and that of the males a dark olivaceous brown, and one from Louisiana in which the general colour of both the males and females was a dark olivaceous brown. Both strains were bred through many generations in the laboratory at 75–80°F. on eggs of *Thyridopteryx ephemeraeformis*, Haw. The results, which are given in tables and graphs, show that the Massachusetts strain has a shorter developmental period, the adult males live longer and the females are more productive, all these differences being statistically significant. Although the two strains cannot be distinguished by these differences, because of the pronounced intergradation of the characters, the author points out the value of quantitative studies of this kind in certain types of taxonomic work. Under the conditions of this study the Massachusetts strain exhibited greater variability than the Louisiana one in all the characters studied except in the length of the developmental period. Tests indicated that the two strains do not interbreed.

DA COSTA LIMA (A.). **Novo ichneumonideo parasito de** *Papilio anchisiades capys* **(Hübner).**—*Campo* **6** no. 6 pp. 20–21, 5 figs. Rio de Janeiro, June 1935.

Angitia (*Inareolata*) *brasiliensis*, sp. n., is described from females reared from larvae of *Papilo anchisiades capys*, Hb., on orange in Rio de Janeiro. Another Ichneumonid, *Pedinopelte gravenhorsti*, Guér., was obtained from the pupae.

DA COSTA LIMA (A.). **Um novo parasito endofago de** *Mormidea poecila.*—*Campo* **6** no. 6 pp. 21–22, 2 figs., 4 refs. Rio de Janeiro, June 935.

The Tachinid, *Beskia cornuta*, Br. & Berg., is recorded as parasitising adults of the Pentatomid, *Mormidea poecila*, Dall., a pest of rice in Rio Grande do Sul.

BONDAR (G.). **Tingitideo nocivo ás Anonaceaes frutiferas no Brasil.** [A Tingid injurious to Anonaceae with edible Fruits in Brazil.]—*Campo* **7** no. 73 p. 51, 1 fig. Rio de Janeiro, January 1936.

Teleonemia morio, Stål, attacks *Anona squamosa* (custard apple) and *A. cherimolia* in Brazil, but is easily controlled by sprays of kerosene emulsion or nicotine.

BONDAR (G.). **Algunas pragas de sapotaceas frutiferas no Brasil.** [Some Pests of Sapotaceae with edible Fruits in Brazil.]—*Campo* **7** no. 74 pp. 19–20, 2 figs. Rio de Janeiro, February 1936.

A Buprestid, *Chrysobothris sexpunctata*, F., and a weevil, *Cratosomus roddami*, Kirby, mine in the stems and branches of *Lucuma nervosa.* The fruits of " Pará apricot " (? *Campho campestris*) are infested by two weevils, *Conotrachelus mamillatus*, Boh., and *Spermologus impressifrons*, Mshl., which develops in the seeds.

BENATAR (R.). **Fungos entomogenos dos Citrus.** [Entomogenous Fungi of *Citrus.*]—*Rodriguésia* **1** no. 2 pp. 7–10, 1 fig. Rio de Janeiro, 1935.

Brief notes are given on entomogenous fungi found on *Citrus* in Brazil, including *Aschersonia aleurodis*, commonly parasitic on Aleurodids, *A. goldiana*, especially on *Dialeurodes citrifolii*, Morg., and *A. turbinata*, on *Ceroplastes* spp.

TSENG (Shen) & TAO (Chia-chu). **A List of the Aphididae of China with Descriptions of four new Species.** [*In Chinese.*]—*Ent. & Phytopath* **4** no. 7–9 pp. 120–176, 3 figs., 5 pp. refs. Hangchow, China, 21st March 1936.

This systematic list comprises 108 species of Aphids, of which 24 are recorded for the first time in China and 4 are described as new. It shows the plants they attack and their distribution in China and in other parts of the world.

LUH (Nien-tsin). **Ueber die Inspection nach Eiern der Citrusschaedlinge : *Ricania speculum* Walk. (Hom. Fulgor.) in Hwangyen von Chekiang.** [On the Survey of Eggs of Citrus Pests: *Ricania speculum* in Hwangyen in Chekiang.]—*Ent. & Phytopath.* **4** no. 7–9 pp. 176–177. Hangchow, China, 21st March 1936.

Records are given of a survey of *Citrus* groves in 4 districts of Chekiang for eggs of the Fulgoroid, *Ricania speculum*, Wlk., which is a very serious pest there. The average number of twigs bearing eggs was 36 per tree.

RAMAKRISHNA AYYAR (T. V.). **The Important Insect Pests of the Castor Oil Plant in S. India with Suggestions for their Control.**—*Trop. Agriculturist* **86** no. 2 pp. 113–117. Paradeniya, February 1936. (Repr. from *Madras agric. J.* **23** no. 12. Madras, December 1935.)

Of the pests of castor (*Ricinus communis*) in southern India [*cf. R.A.E.*, A **19** 396], one of the chief is the Noctuid, *Achaea janata*, L., the larvae of which feed on the leaves and pupate in folded leaves or in the soil. The larval and pupal stages last about a fortnight each. The larvae seldom attack other plants, but are occasionally found on rose, pomegranate and *Euphorbia*. They are parasitised by the Braconid, *Microplitis maculipennis*, Szép. (*ophiusae*, Ram. Ayyar). Polyphagous Lepidopterous larvae that sometimes feed on the leaves of castor include *Prodenia litura*, F., *Euproctis fraterna*, Moore, *Dasychira* (*Olene*) *mendosa*, Hb., *Parasa lepida*, Cram., and *Ergolis merione*, Cram. *Dichocrocis punctiferalis*, Gn., bores into the stems, particularly at the junction with side shoots, and also attacks the ripening seed capsules. Infested shoots are covered with webbing, and black excrement is present. Turmeric, ginger and cardamon are among the alternative food-plants of this Pyralid. *Saissetia nigra*, Nietn., and other Coccids infest castor occasionally.

SCHWEIZER (J.). **Jaarverslag Tabak over Juli 1934 t/m Juni 1935.** [Annual Report on Tobacco from July 1934 to June 1935 inclusive.] —*Meded. Besoekisch Proefst.* no. 53, 65 pp. [Djember] 1935. [Recd. March 1936.]

In the course of this report it is stated (p. 39) that in the Besoeki region, Java, *Myzus persicae*, Sulz., appeared with the advent of the dry season, first in high-lying tobacco plantations and then lower down in shady places. It disappeared with the first heavy rains. The tobacco Capsid, *Cyrtopeltis* (*Engytatus*) *tenuis*, Reut., was abundant, and *Gryllotalpa africana*, P. de B., and *G. hirsuta*, Burm., caused much injury to the seedlings.

VAN DER VECHT (J.). **Some Notes on the Life-history of *Apoderus clavatus* Pasc. (Col., Curculionidae).**—*Ent. Med. Ned.-Ind.* **2** no. 1 pp. 9–12, 2 figs. Buitenzorg, 1st March 1936.

Apoderus clavatus, Pasc., all stages of which are very briefly described, was observed on *Derris elliptica* in West Java in 1934 and subsequently some *Derris* plants were partly defoliated by it at Buitenzorg. The whole development takes place within a rolled leaf. The female begins rolling a leaf, deposits an egg within, finishes the roll to a nearly cylindrical shape, gnaws through the mid-rib and thus causes the roll to fall to the ground. The larva hatches in 3–4 days and feeds on the inner part of the leaf-roll, which has already turned a dull brown. The larval and pupal stages last 4–5 and 3–4 days respectively, and their development is favoured by a moist atmosphere. After remaining in the roll for 2 days, the young adult gnaws its way out and soon begins feeding on the young leaves. Oviposition occurs after about 14 days. A female can construct from 1 to 4 rolls a day, rarely 5 or more. Four females kept with males on living plants in the open laid 24, 25, 31 and 33 eggs respectively. Captive adults lived for more than 3 months.

THOMAS (P. H.) & RAPHAEL (T. D.). **Oil Emulsions and Red Spider. Summary of Experiments.**—*Tasm. J. Agric.* (N.S.) **7** no. 1 pp. 19–20. Hobart, 1st February 1936.

In view of the large number of oil sprays now on the market for the control of fruit pests, the laboratory experiments carried out in Tasmania in 1932–33 [*R.A.E.*, A **21** 210] were repeated in order to find the most efficient. Pieces of apple branches about 12 inches long infested with the eggs of *Bryobia praetiosa*, Koch, and *Paratetranychus pilosus*, C. & F., were suspended on a line and sprayed thoroughly with 16 proprietary sprays at recommended and other strengths on 21st August. This method was considered more reliable than the dipping process used previously [*loc. cit.*], as an excess of oil might be deposited on the twigs as they were withdrawn from the liquid particularly with quick-breaking emulsions under certain conditions of temperature and humidity. The mites began to hatch in the first week in September, and by the end of October practically all the viable eggs, about 75 per cent., had hatched. The control twigs were so heavily infested that many of the first leaves were shrivelled and falling. Prepared crude oils were less effective than the standard prepared oils, but at 1 : 12 produced reasonable control. The manufacturer's recommendations were on the whole too weak for effective control, 1 : 15 being the weakest strength at which good control was obtained. Combinations of oil and lime-sulphur gave disappointing results, though it is possible that if the sprays had been applied some weeks later the eggs might have been in a more susceptible condition. The heavier oils were the more efficient. Several of the mayonnaise types of emulsion were disappointing.

CUMMINS (J. E.) & WILSON (H. B.). **The Starch Content of some Australian Hardwoods in Relation to their Susceptibility to Attack by the Powder Post Borer,** *Lyctus brunneus* **Stephens.**—*J. Coun. sci. Industr. Res. Aust.* **8** no. 2 pp. 101–110, 8 refs. Melbourne, May 1935. **The Preservation of Timber against the Attacks of the Powder Post Borer (***Lyctus brunneus* **Stephens) by Impregnation with various Chemicals.**—*Op. cit.* **9** no. 1 pp. 37–56, 2 figs., 9 refs. Melbourne, February 1936.

The results of laboratory experiments carried out in Australia in 1932–33 and described in the first of these papers, together with the examination of samples of a large variety of Australian timbers infested with *Lyctus brunneus*, Steph., definitely indicate that infestation by these beetles is essentially dependent upon the presence of starch in the sapwood [*cf. R.A.E.*, A **20** 454 ; **24** 8]. There appears to be a limiting starch content, which is, however, very small and can be designated as a trace. No attack apparently occurs until the starch concentration exceeds this limit, and in general the greater the starch content the greater the extent of damage. Variation observed in the degree of attack is probably due to irregular distribution of starch in the sapwood ; this was sometimes confined to the ray parenchyma or to longitudinal wood parenchyma of various types, and sometimes occurred in both.

In the second paper an account is given of work in 1933, 1934 and 1935 to test the effectiveness of impregnating normally susceptible hardwood timber with chemicals as a protection against attack by *L. brunneus.* Only specimens containing sufficient starch to render them liable to attack and having large pores, the diameter of which ranged from 205 to 240μ [*cf.* **23** 147], are included in the results given. Each specimen was measured and weighed, and then immersed in a boiling solution of preservative. Treatment with water-soluble preservatives was carried out in open vessels, provision being made to prevent concentration of the solutions by evaporation. For benzene- or alcohol-soluble materials, the treatment was made under a reflux condenser. The specimen was boiled for one hour and then allowed to cool in the solution. After removal it was wiped and re-weighed. The absorption of preservative was then calculated in terms of lb. per cu. ft. of wood. In general, a 1 per cent. aqueous solution gave an absorption of about ½ lb., other concentrations giving proportional absorptions. Complete penetration was obtained in all specimens. After treatment, the specimens were again air-dried, and then trimmed to a size of about 8 by 3 by 1 cm., wood being removed from all surfaces. Untreated controls, and controls treated with solvents alone, were also prepared.

Sodium fluosilicate was the most toxic of the inorganic chemicals tested, effectively preventing attack at a concentration of 0·024 lb. dry salt per cu. ft. of wood, whereas borax, sodium fluoride, and zinc chloride gave effective protection at concentrations of 0·04, 0·05 and 0·1 lb. respectively. All these preservatives are cheap, and their commercial use is practicable. Mercury bichloride also appeared to be very toxic but has other characteristics that render it unfit for general use, and other chemicals, such as calcium chloride, magnesium sulphate and sodium chloride, seemed to have little toxic value. Although promising results were obtained with certain organic chemicals including chlorinated naphthalenes and organic mercurials such as Lignasan, further tests will be needed to estimate accurately their relative values.

Two methods of testing, one using larvae and the other adult beetles, are described. The larval test did not give satisfactory results and failed to allow of the ready evaluation of the chemicals. The young larvae failed to establish themselves, even in the untreated controls, and the older larvae rapidly pupated without much feeding. The beetle test seemed to be very effective, though it requires more time and can only be carried out during a restricted period of the year. The beetles were obtained from naturally infested timber samples kept in jars. Ten pairs were placed in a petri dish to the bottom of which paper had been glued to give them a foothold, together with a specimen of the timber, which was rested on two short pieces of wire to allow access to all portions. One face and one edge of the timber was dressed and one end cleanly cut to expose the pores, the remaining face, edge and end being rough sawn. As the beetles tended to concentrate on the under surface of the wood when exposed to light, the dish was transferred to a shelf screened with black cloth to exclude light. The test specimen was left long enough to allow the second generation of beetles to emerge, and then cut to pieces for examination. The amount of beetle emergence appeared to have no relation to the value of the preservative, the most important criterion being the actual amount of damage to the specimen. Considerable attack occurred in all the untreated specimens, and five grades of attack (trace, slight, moderate, severe and destroyed) were recognised in assessing the value of the preservatives. In specimens containing a trace of attack no live larvae could be found, all having died at an early stage, and the value of the wood for any purpose was not affected.

ANDREWARTHA (H. V.). **Thrips Investigation. 8. The Influence of Temperature on the Rate of Development of the immature Stages of** *Thrips imaginis* **Bagnall and** *Haplothrips victoriensis* **Bagnall.**—*J. Coun. sci. industr. Res. Aust.* **9** no. 1 pp. 57–64, 3 figs., 4 refs. Melbourne, February 1936.

The relation between temperature and the speed of development of *Thrips imaginis*, Bagn., and *Haplothrips victoriensis*, Bagn., was studied in 1934 and 1935 in continuation of an investigation of the seasonal abundance of thrips in Australia begun in 1933 [*R.A.E.*, A **22** 60, etc.]. The technique of the experiments is described, and the results are shown in tables. It was found that the relation between temperature and duration of both incubation and post-embryonic development can be expressed as a straight line for each species. With *T. imaginis* the development zero was 9·3°C. for incubation and 7·02°C. for the post-embryonic period, and the thermal constants were 41·3 and 125·5 day-degrees C. respectively. With *H. victoriensis* the zero was 7·21° for incubation and 6·8° for post-embryonic development, and the thermal constants 85·2 and 275·1 day-degrees.

Field observations in Adelaide showed that whereas *T. imaginis* reached maximum numbers in November and December 1932–35 and then fell away rapidly, the populations of *H. victoriensis* were highest during December, January and February in those years. As the zero for post-embryonic development is practically the same for both species, the difference in their behaviour must be due either to the relatively slower development (higher thermal constants) of *H. victoriensis* or to factors other than their different temperature requirements.

MUGGERIDGE (J.). **The Potato-tuber Moth.** (*Phthorimaea operculella,* **Zell.**)—*N.Z. J. Agric.* **52** no. 2 pp. 85–88, 2 figs., 2 refs. Wellington [N.Z.], 20th February 1936.

Brief notes are given on the appearance of all stages of *Phthorimaea operculella*, Zell., and the injury it causes to potatoes in New Zealand. Its abundance is influenced largely by climatic conditions, and in the dry summer of 1934–35 it caused considerable loss of crop, especially near Auckland. The usual preventive measures applied in the field are described. Infested storage tubers should be fumigated with carbon bisulphide at the rate of 5 lb. per 1,000 cu. ft. for not longer than 18 hours. If necessary they can be fumigated in the field under a large tarpaulin, the edges of which are carefully covered with loose earth. The best results will be obtained at temperatures of 75–90°F., and it is inadvisable to fumigate when the temperature is below 60°F. A second fumigation may be necessary after 10–14 days to kill larvae or moths that may emerge from surviving eggs or pupae. As it is not certain that carbon bisulphide does not affect the value of potatoes for seed, only uninfested material should be used for this purpose, and it should be stored in bags in a place free from moths. The practice of "greening" the seed by spreading it out in the open should be delayed until the cold weather when the moths are inactive.

ZOLOTAREVSKY (B.). **Note préliminaire sur le criquet migrateur** (*Locusta migratoria migratorioides* **Rch. & Frm.**) **dans le Soudan français.**—*Bull. Soc. Hist. nat. Afr. N.* **27** no. 1 pp. 23–46, 1 ref. Algiers, January 1936.

The work discussed was carried out in 1932–34 in the Circles of Macina, Nara and Nema, as well as inside the great bend of the river Niger. The solitary phase of *Locusta migratoria migratorioides*, R. & F., occurred in most of the areas surveyed; in general in the French Sudan 15°30′N. Lat. is the northern limit of the area permanently inhabited by this species, but it extends further north in the Niger inundation zone and round the lakes of Nara. The probable outbreak centres are situated between 14° and 15°30′N. Lat. An account of the climatic and vegetation conditions in the areas surveyed is given, and their relation to the biology of the locust is discussed.

In the inundation zone of the Niger, *L. m. migratorioides* breeds twice a year, but the conditions are not favourable to the production of the swarming phase [*cf. R.A.E.* A **24** 234]. Breeding begins in May, with the commencement of the rainy season, and the resultant hoppers have reached their last instar or have become immature adults by the time the area is inundated in July. The rise of the water is rapid, and most of the locusts do not reach higher ground, but find refuge on the grasses that emerge above water, on which they exist until the flood recedes. This takes place very gradually, and since the locusts do not reach sexual maturity until they are over firm ground, oviposition and the hatching of the second generation are extended over a considerable period. Consequently, in spite of some concentration of egg-deposits on exposed areas, and the appearance of considerable numbers of individuals as a result of the double breeding, the bands, even if they are formed, will be composed of hoppers of different instars, and will tend to disintegrate. During the dry period the inundated areas dry up, and the locusts are further dispersed by the burning of the dried vegetation.

Outside the inundation region, numerous individuals of ph. *solitaria* were found to exist in the southern part of the Sahel zone, in Circle Macina and inside the bend of the river Niger. Here again conditions do not favour the production of swarms. The breeding period is confined to the rainy season, and after October the country dries up so that the locusts can survive only in the neighbourhood of permanent pools, where they are trampled upon and dispersed by numerous herds of cattle, which congregate round the water.

It is concluded that abnormal conditions must occur to make the production of the swarming phase possible. The beginning of the last outbreak of *Locusta* is reviewed [*cf.* **21** 32], and it is concluded that the climatic conditions in 1927 and 1928 could not have led to the transformation into ph. *gregaria* of the *solitaria* population in the inundated zone in Circle Macina where the first swarms were observed in June 1928. On the other hand, the extensive floods that occurred in 1924 and 1925, during which the water penetrated far into the Sahel region, particularly to the north-west of Lake Diaka, must have led to the development of extensive new breeding grounds for *Locusta*, which could have continued to breed there till March 1926, giving rise to an abundant population. In 1926 the floods were low, and the decrease of the sites suitable for oviposition during the summer breeding season of that year probably resulted in the appearance of the first swarms of ph. *gregaria*. The swarms must have remained unnoticed in the scarcely populated region in 1927, but in 1928 they were driven by the drought to the more humid southern part of the inundated area, where they were first recorded in June.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. I.b. Krankheiten am Stamm. II. Beschädigungen der Zweige und Triebspitzen.** [Coffee Pests and Diseases in Africa. I.b. Diseases of the Stem. II. Injuries to the Branches and Shoot Tips.] —*Tropenpflanzer* **39** no. 3 pp. 91–118, 8 figs. Berlin, March 1936.

This is the second of a series of articles collating data on the pests and diseases of coffee in Africa, with particular reference to their control [*R.A.E.*, A **23** 759]. The insects dealt with are Scolytid twig-borers, the Aphid, *Toxoptera aurantii*, Boy., and Coccids that attack chiefly the stems, branches and shoots (with notes on the ants that foster them). A list of all the Coccids that have been recorded on coffee in Africa is included.

HARRIS (W. V.). **Termites and Cotton Growing.**—*Emp. Cott. Gr. Rev.* **13** no. 2 pp. 121–123. London, April 1936.

The author points out that although some termites are known to attack cotton in Tanganyika, others have a beneficial function. *Hodotermes mossambicus*, Hag., occurs in the drier parts of the Territory and in the west is a minor pest defoliating cotton. *Microcerotermes parvus*, Hav., is found in the coastal cotton area, where it attacks the stems of the perennial " Moco " but not the " Upland " variety. In the north-west, *Microtermes* sp. damages the " Upland " variety severely, entering at the collar, or by the roots. Cotton should not be planted in ground severely infested with these species. On the other hand, *Macrotermes* (*Bellicositermes*) *bellicosus*, Smeath., *M.* (*B.*) *goliath*, Sjös., *M.* (*B.*) *natalensis*, Hav., and *Termes badius*, Hav., assist in the destruction of cotton residues. Termites also stir and ventilate the soil.

HARGREAVES (H.). **Report of the Government Entomologist for 1934.**—*Rep. Dep. Agric. Uganda 1934* pt. 2 pp. 62–72. Entebbe, 1936.

Investigations in Uganda in 1934 showed that infestation of cotton by Jassids was very low (average less than 3 nymphs per 10 leaves) and that intense reddening of the leaves could occur in the absence of the insects. True Jassid reddening was observed on one occasion during the year, on a plot attacked by three species, including *Empoasca benedottoi*, Paoli (the most abundant) and *E. fascialis*, Jac. There was an average of 17·5 nymphs per 10 leaves, but in spite of this the crop was good. It is concluded that until the population rises above 20 per 10 leaves the damage due to Jassids is negligible. Observations on material collected in 1933 showed that the larvae of *Platyedra gossypiella*, Saund., can undergo a resting stage in Uganda that lasts for at least 7 months. Larvae found on *Hibiscus cannabinus* and *H. rostellatus* near heavily infested cotton all appeared to be *P. erebodoxa*, Meyr., but it is not certain that *P. gossypiella* may not have been represented among them. In limited observations, cotton growing near ginneries showed a higher percentage of stained locks than cotton growing at a distance of 3 miles, possibly owing to the spread to it of *Dysdercus* from the seed dumps at the ginneries. In one district a complete burning of the grass reduced the range of wild malvaceous food-plants of *Dysdercus* to weeds (*Abutilon* and *Wissadula*) growing in cultivated plots. Unexpectedly, however, *Sorgum sudanense* was found to serve as an alternative food-plant, though there were indications that the insects breed on it only when the ripe seed-heads are closed and in a rather moist condition.

An account is given of studies on the effect of sowing dates, varieties and other factors on damage to cotton by *Lygus* [*cf. R.A.E.*, A **24** 106, 107]; it is not certain that *L. simonyi*, Reut. (*vosseleri*, Popp.) is the only species concerned. It appears that the damage results when the plants are succulent. In areas that have been deforested and that have marked dry seasons, cotton must be sown early so that it makes most of its vegetative growth during the early rains and further growth during the late rains. In drier districts therefore the young cotton actually gets more rain and is temporarily more succulent, so that it suffers more from *Lygus* during the growing period. In very dry districts that also have a high phosphate content in the soil, the succulent condition cannot develop and damage by *Lygus* is absent. In areas with a more even climate, cotton can be sown later, during the period between the early and late rains. In these areas the young plants get less rain than in the dry areas and suffer proportionately less from *Lygus*.

By the end of the year few swarms of *Locusta* [*migratoria migratorioides*, R. & F.] remained [*cf.* **23** 10]. They caused some damage locally, particularly in the northern districts. The northern limit of *Nomadacris* [*septemfasciata*, Serv.], which entered Uganda [*cf.* **23** 637] from the south in June, was 1°15′N. Lat. In the south and south-west considerable damage to crops was reported.

Of a consignment of 600 adults of *Plaesius javanus*, Er., the Histerid predator of the banana weevil, *Cosmopolites* [*sordidus*, Germ.], despatched from Java on 5th September, 225 were alive on arrival on 19th October, but 820 of a second consignment died before arrival. Immersion of infested coffee berries in cold water for several days failed to kill *Stephanoderes hampei*, Ferr.

Entomological Investigations.—*Rep. Coun. sci. industr. Res. Aust.* **9** (1934–35) pp. 28–34, 69–70. Canberra, 1936.

During 1934–35, further consignments of insects, including *Chrysomela hyperici*, Forst., *C. brunsvicensis*, Grav., *Lathronympha hypericana*, Hb., *Aphis chloris*, Koch, *Anaitis plagiata*, L., and *Depressaria hypericella*, Hb. [*cf. R.A.E.*, A **22** 223; **23** 397], were received in Australia for the biological control of St. John's wort (*Hypericum perforatum*). Adults of *C. hyperici* and *C. brunsvicensis* were liberated in Victoria, but subsequent observations indicated that few survived. Of insects imported against Noogoora burr (*Xanthium pungens*)

[**23** 397], over 13,000 individuals of *Euaresta aequalis*, Lw., were liberated in Queensland. Adults of *Baris callida*, Csy., fed on leaves of artichoke in the laboratory when nothing else was available, and the previous observation that *Cylindrocopturus adspersus*, Lec., feeds on sunflower [*Helianthus annuus*] and Jerusalem artichoke [*H. tuberosus*] was confirmed. These insects will, therefore, not be liberated at present. Consignments of *Tyria jacobaeae*, L., were liberated in Victoria for the control of ragwort (*Senecio jacobaea*). *Biscirus lapidarius*, Kramer, a predator of *Smynthurus viridis*, L. [*loc. cit.*], is now established in South Australia, Victoria and Tasmania. Unsuccessful attempts were made to establish *Leucopis obscura*, Hal., *Exochomus quadripustulatus*, L., and *Hemerobius stigma*, Steph. [*loc. cit.*] on pines infested with *Chermes* [*pini*, L.] in the field and insectary. *Exochomus*, however, bred slowly in the insectary. *Habrolepis dalmanni*, Westw., the parasite of *Asterolecanium variolosum*, Ratz. (oak scale), has become established at Launceston, Tasmania, but as it breeds slowly it will probably be some time before it has any effect. *Encarsia formosa*, Gah., which was introduced from New Zealand, quickly established itself on *Trialeurodes vaporariorum*, Westw., in a greenhouse and also later in the field and insectary. Parasitism was heavy, and there was no difficulty in maintaining supplies of the parasite throughout the winter. Only small supplies of *Hexamera* [*cf.* **23** 398] were available in New Zealand, and conditions in Tasmania were unfavourable for liberation. Attempts to establish these flies against *Oncopera* were therefore confined to certain places in Victoria and to one in the Federal Capital Territory.

Work on *Cydia molesta*, Busck [*cf.* **23** 725] and *Thrips imaginis*, Bagn. [*cf.* **23** 726 ; **24** 135], has already been noticed. Investigations on grasshoppers showed that a large proportion of the females in recent swarms were infertile, and this, together with the very heavy mortality that occurred among the young hoppers of the second generation and the high incidence of parasites, probably accounted for the rapid disappearance of the pest at the end of the season. Preliminary results of a study of the effects of dry conditions on the eggs of some common species indicate that those of *Gastrimargus musicus*, F., are more resistant to drying than those of *Chortoicetes* (*Calataria*) *terminifera*, Wlk. White arsenic, successfully used for the destruction of *Eutermes exitiosus*, Hill, in mounds [**23** 398], has also proved satisfactory against termites in timber, provided that the place of application is dry. The total population of an average-sized mound of *E. exitiosus*, 1½ ft. high and 4 ft. wide at the base, was about 1,800,000 termites, weighing over 17 lb. and comprising about 1,560,000 workers, 200,000 soldiers, and 40,000 nymphs. A large number of these are to be found in galleries leading from the mound, except in the very coldest weather. The relative humidity within the populated mounds exceeds 95 per cent., and the temperature is fairly high. In laboratory tests the larvae of *Plodia interpunctella*, Hb., *Ephestia cautella*, Wlk., and *E. elutella*, Hb., easily penetrated tin foil, aluminium foil and greased paper but not 18-mesh wire gauze. Fumigation of the nests with carbon bisulphide was fairly satisfactory for the control of *Iridomyrmex detectus*, F. Sm. A bait of flour paste, sugar and barium fluosilicate spread on cards gave very good results against *Ctenolepisma longicaudata*, Escherich, which is becoming increasingly troublesome in houses in Canberra.

Cactoblastis cactorum, Berg, continues to give satisfactory control of prickly-pear [*Opuntia inermis* and *O. stricta* (*cf. loc. cit.*)] throughout

Queensland and the greater part of New South Wales. Seedling plants, that have sprung up on reclaimed land have in most cases been destroyed effectively, and elsewhere the infestation is such that control will probably be effected in time. Pyralids introduced from Argentina were *Tucumania* sp. for the control of tiger-pear (*O. aurantiaca*) and *C. bucyrus*, Dyar, for the control of *O. tomentosa*.

SWEZEY (O. H.). **Biological Control of the Sugar Cane Leafhopper in Hawaii.**—*Hawaii. Plant. Rec.* **40** no. 1 pp. 57–101, 23 figs., 63 refs.; also as *Bull. Exp. Sta. Hawaii. Sug. Ass. ent. Ser.* no. 21. Honolulu, January 1936.

A historical account is given of the control of the sugar-cane leafhopper, *Perkinsiella saccharicida*, Kirk., in Hawaii, by means of natural enemies [*cf. R.A.E.*, A **9** 602] introduced between 1904 and 1920. Of these *Cyrtorhinus mundulus*, Bredd. [*cf.* **8** 525] and *Paranagrus optabilis*, Perk. [*cf.* **3** 758] were the most effective. Natural enemies of the leafhopper that were already present in Hawaii and helped to bring about control are also discussed.

WILLIAMS (F. X.). **Entomology.**—*Rep. Comm. Exp. Sta. Hawaii. Sug. Pl. Ass. 1935* pp. 17–25. Honolulu, 1936.

An account is given of work carried out in Hawaii during 1934–35, mainly on sugar-cane pests.

No further spread of *Anomala orientalis*, Waterh., has occurred [*cf. R.A.E.*, A **23** 341]. The final consignment of parasitised material from Guatemala was received in October 1934, and a total of 2,225 parasitised Lamellicorn larvae and parasite cocoons have now been imported, from which 1,522 Scoliids comprising 8 species have been reared. The commonest of these was *Elis pulchrina*, Cam., of which one individual was recovered, 6 months after the last liberation was made, and a species resembling *Scolia manilae*, Ashm. *E. fulviceps*, Cam., *E. ornaticeps*, Cam., and *Tiphia* spp., which also emerged in small numbers, all attacked the larvae of *A. orientalis*. In all, 446 examples of the predacious wireworm, *Pyrophorus* sp., have also been introduced from Guatemala. *Tiphia segregata*, Cwfd., has been fairly abundant in the plantation in which it was found in August 1934 [*loc. cit.*]. It developed from egg to adult in 6–7 weeks in the laboratory. In studies on *A. orientalis*, R. H. Van Zwaluwenburg and H. A. Wadsworth found that a peak of egg laying appeared to occur from late March to May. The resulting generation probably has a shorter life-cycle than that from eggs laid in autumn, because of the higher soil temperatures. The average egg, larval, pupal and preoviposition periods lasted 12–15, 120–130, 9–11 and 3–4 days, respectively [*cf.* **24** 301]. The eggs can withstand a considerable range of temperature; hatching was slightly delayed when they were exposed to an intermittent temperature of 104°F. The introduced toad, *Bufo marinus* [*cf.* **23** 6], which has proved of value against a variety of pests, appears to survive the burning off of the cane fields, and a consignment of it was sent to Queensland [*cf.* **24** 196].

Damage by the cane borer, *Rhabdocnemis obscura*, Boisd., was generally less than usual, probably because of the increasing practice of short cropping. Although age, condition of growth and situation cause some variation in the hardness of any cane, this does not invalidate comparisons of hardness between varieties of the same age and from the same environment. Hard canes are more resistant to attack by the borer. Canes harder than P.O.J. 2878 were P.O.J. 36, 31–1236, 31–2538, 30–453, 32–6045 and 33–7101. The last two are half and quarter bred *Saccharum robustum* seedlings. Several outbreaks of the nutgrass armyworm, *Spodoptera mauritia*, Boisd., occurred during the year, affecting several thousand acres of young cane. Colonies of the egg-parasite, *Telenomus nawai*, Ashm., were reared and distributed with some effect, and extensive applications of arsenical dust were also of value. R. K. Conant reports that a spray of 1 lb. lead arsenate and ½ lb. calcium caseinate in 12½ U.S. gals. water gives control in spite of heavy rain.

The egg-parasite, *Scelio pembertoni*, Timb., was liberated against the Chinese grasshopper [*Oxya chinensis*, Thnb.] on sugar cane in one locality. *Litomastix floridana*, Ashm. [*cf.* **19** 470], a parasite of *Plusia chalcites*, Esp., on tomato, potato and other garden plants, is now established on Kauai. Additional insects imported from Guatemala comprised small numbers of three Eumenid wasps that prey on various forest caterpillars, which were liberated at Honolulu, three species of parasites of *Anthonomus eugenii*, Cano, and *Cissites* (*Horia*) *maculata*, Swed., a Meloid parasitic on two species of carpenter bee (*Xylocopa*). Two of the parasites of *Anthonomus*, which has caused very severe damage to peppers [*Capsicum*] on Oahu and has spread to other islands, were liberated, and one has already become established. From two consignments of wood containing colonies of *Xylocopa* 15 males and 5 females of *Cissites* emerged between 11th May and 14th September. The females laid about 20,000 eggs in batches, which, with the young hatching from them, were placed on posts infested with *Xylocopa varipuncta*, Patton. *X. varipuncta* often seriously damages posts and buildings on all the islands, and is particularly destructive to California redwood [*Sequoia sempervirens*].

EDWARDS (W. H.). **Report of the Government Entomologist.**—*Rep. Dep. Agric. Jamaica 1934* pp. 24–28. Kingston, 1935. [Recd. April 1936.]

Observations in 1934 indicated that heavy infestation of sugar-cane by *Diatraea saccharalis*, F., is rare in Jamaica. The average nodal infestation, as calculated from thousands of stalks, amounted to 5·54 per cent. Infestation was higher when the canes had suffered from hurricanes, were overripe, or were growing under unhealthy conditions, and such canes were frequently also attacked by *Metamasius sericeus*, Ol., and termites. The damage caused by *D. saccharalis* seemed to be practically limited to destruction of tissue ; during the survey, every node of which the rind had been punctured was counted as infested, but in many cases such lesions were insignificant as regards reduction of sucrose. Secondary infestations did not occur unless the canes, particularly P.O.J. varieties, were overripe. *Lixophaga diatraeae*, Tns., the Tachinid parasite of *D. saccharalis*, is distributed throughout the Island. *M. sericeus* was more prevalent than usual during 1934 owing to the number of canes broken down by the high winds of the previous year. The destruction of infested stalks after reaping was advised.

Nezara viridula, L., damaged buds of *Citrus* that had been grafted on to low stumps. A concentrated extract of pyrethrum, diluted with pure kerosene of low density and applied with a hand atomiser, was effective against *Coccus viridis*, Green, on *Citrus* and on coffee, but *Citrus* is reinfested by this Coccid more quickly than by others, mainly by means of the ant, *Solenopsis geminata*, F., which transports it [*cf. R.A.E.*, A **23** 394]. However, infestation on the young branches spreads slowly, and may be controlled by localised spraying between scheduled sprays for scale insects.

Infestation of bananas by *Cosmopolites sordidus*, Germ., has increased, probably because the plants blown down by the high winds and not removed provided suitable breeding places. Groves of coconut in which some of the palms had been blown down and left to rot were infested with *Xyleborus perforans*, Woll., and *Strategus titanus*, F. Mangos were heavily infested by the larvae of *Anastrepha longimacula*, Greene. Local injury to tomato plants was caused by *Gryllulus* (*Gryllus*) *assimilis*, F.

BLANCHARD (E. E.). **Apuntes sobre Calcididos argentinos.** [Notes on Argentine Chalcids.]—*Rev. Soc. ent. argent.* **7** pp. 103–122, 8 figs. Buenos Aires, 14th November 1935. [Recd. April 1936.]

The species dealt with include *Brachymeria cactoblastidis*, sp. n., parasitic on *Cactoblastis bucyrus*, Dyar ; *B. koehleri*, sp. n., on *Parexorista* (*Phorocera*) *caridei*, Brèthes ; *B. pseudovata*, sp. n., on *Tortrix* (*Archips*) *rosaceana*, Harr. ; *Psychidosmicra australis*, gen. et sp. n., *P. brethesi*, sp. n., and *P.* (*Heptasmicra*) *brasiliensis*, Brèthes [*R.A.E.*, A **7** 125] on *Oeceticus kirbyi*, Guild. ; *Spilochalcis patagonica*, sp. n., probably a parasite of *P. australis*, with which it was obtained from the bags of *O. kirbyi* ; and *S. paranensis*, Schrottky, and *S. vigintidentata*, Brèthes, bred from larvae of *O. kirbyi*.

JACOB (J. K.). **The European House Cricket,** *Gryllus domesticus*, **now in Vancouver.**—*Proc. ent. Soc. B. C.* no. 32 pp. 18–19. Victoria, B.C., January 1936.

In September 1934, the cricket, *Gryllulus* (*Gryllus*) *domesticus*, L., was taken in Vancouver, but it was not found there in 1935. During 1927 and 1928 it caused considerable annoyance in Ontario [*cf. R.A.E.*, A **15** 32], migrating in cold weather from the rubbish dumps, where it bred, to basements and cellars of houses. At night it injured upholstered furniture, curtains, etc.

OLDS (H. F.). **The Distribution of the Rhododendron White Fly in British Columbia. Notes on its Life History and Control Measures.** —*Proc. ent. Soc. B.C.* no. 32 pp. 23–25, 4 refs. Victoria, B.C., January 1936.

In view of the export trade in rhododendrons from British Columbia to the United States, all plants imported from England since 1928 were examined for *Dialeurodes chittendeni*, Laing. Rhododendrons imported in the autumn of 1933 and the spring of 1934 were found to be infested, but not those of earlier consignments. The climate may therefore be unsuitable for this whitefly. Only smooth leaved species seem to be infested [*cf. R.A.E.*, A **23** 430], and the first symptom of attack is the mottling of the older leaves on the lower surface, where the larvae feed. In early summer the upper surface of the leaves may be covered with sooty moulds growing on the honey-dew excretion of the insects. In the coastal districts the adults are on the young foliage from late May until the first or second week in June, and are active in bright weather.

A spray of 2 per cent. emulsified oil containing ½ teaspoonful nicotine sulphate per gal., applied to the lower surface of the leaves with some pressure, gave good control. A 3 per cent. nicotine dust might also be effective.

SPENCER (G. J.). **An Outbreak of** *Autographa californica* **Speyer around Kamloops, Summer 1934.**—*Proc. ent. Soc. B.C.* no. 32 pp. 26–28. Victoria, B.C., January 1936.

In late May 1934 larvae of *Plusia* (*Autographa*) *californica*, Speyer, became abundant on lucerne in south-central British Columbia, having migrated to it from sweet clover [*Melilotus*] growing along irrigation ditches. When the lucerne was cut at the end of the month, some of the larvae were already pupating, but the others moved out of the fields in armies, eating anything in their path. Vegetable gardens suffered greatly ; lettuce, radish, beans and beet were preferred in that order, and even rhubarb was attacked.

Control by the usual methods was not feasible since the infestations were not observed until the larvae had become too numerous to combat. Irrigation water was diverted into ditches dug round fields and gardens for protection, and fowls were liberated in infested gardens. These measures were only effective when the larvae were not very abundant. The outbreaks only lasted about two days in any one place. The larvae were killed by disease when the humidity was high. Parasites reared were *Macrocentrus amicroploides*, Vier., *Apanteles* sp. near *xylinus*, Say, *Pimpla* (*Ephialtes*) *atrocoxalis*, Cress., which is recorded for the first time from British Columbia, and the Tachinids, *Voria ruralis*, Fall., and *Lydella delecta*, Curran. Moths emerged in the rearing experiments after a pupal period of 15 days and were observed in the field for about a week, which suggests that two generations are produced in a year, though no second brood larvae were observed in 1934.

ZOLK (K.). **Märkmeid kodumaa üraskite ökoloogia kohta I.** [Contributions to the Ecology of Bark-beetles I.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 32 ; repr. from *Estländ forstw. Jb.* **7** pp. 258–294, 18 diagr. Tartu, 1935. (With a Summary in German.) [Recd. April 1936.]

The following is taken from the summary : In studies begun in Estonia in 1932, trunks of spruce, *Picea abies* (*excelsa*), were felled and placed leaning against other trees in spring and were examined in June and July. The methods used are described. The logs were classed according to whether the predominant Scolytids infesting them were species of *Ips* of the subgenus *Pityogenes*, *I. amitinus*, Eich., *I. typographus*, L., *Pityophthorus* spp., or a combination of *I. amitinus* and *I.* (*Pityogenes*) *chalcographus*, L., with the latter predominant. It was found that the condition of the trunk influences the time, place and amount of infestation, and the species present, and that the occurrence of competing species influences the abundance of the species that appear later. Thick bark did not prevent the boring of brood mines by species that usually infest thin bark.

A trunk begins to become "mature" mid-way up. Maturity first extends towards the summit and only later downwards. *I. typographus* usually infests the immature parts. *I. chalcographus* first occurs in those that are above the middle and so mature first, but it is not an exigent species, and attacks comparatively immature trees. *I. amitinus* is its chief competitor, attacking the same places, sometimes even earlier. The southern side of a trunk matures earliest and is the first to be infested, but the amount of infestation is about the same as on the northern side.

MÄÄR (A.). **Majasiku** (*Hylotrupes bajulus* **L.**) **levimine ja kahjustus Eestis, andmeid senistest tôrjeabinôudest meil ja tôrje edusammudest välismail.** [*H. bajulus* in Estonia.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 33 ; repr. from *Estländ. forstw. Jb.* **7** pp. 316–338, 13 figs., 50 refs. Tartu, 1935. (With a Summary in English.) [Recd. April 1936.]

Hylotrupes bajulus, L., occurs throughout Estonia, but, as in other countries [*R.A.E.*, A **19** 379], injury by it has only developed during the last 20–30 years. It destroys the timber of buildings, telegraph poles, fences, etc., made from spruce and pine and is most abundant along the Gulfs of Finland and Riga and on the islands, local infestation involving the majority or all of the buildings. The damage caused is very severe and increases every year, so that houses sometimes collapse. A detailed investigation on the extent of the damage is to be carried out, and systematic control operations instituted. The measures so far practised, which have consisted in cutting out infested wood and applying carbolic acid to kill the larvae or protect uninfested timber, have not given satisfactory results.

MÄAR (A.) & VOORE (V.). **Märkmeid ürasklaste (Ipidae) fauna kohta Tartu Ulikooli Kuusnõmme bioloogia-jaamas (Saaremaal).** [Notes on the Bark-beetles observed at the Biological Station of the University of Tartu in Kuusnõmme.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 34 ; repr. from *Estländ forstw. Jb.* **7** pp. 641–651, 5 figs., 12 refs. Tartu, 1935. (With a Summary in German.) [Recd. April 1936.]

As a result of a survey in July 1931 and August 1932, 33 species of bark-beetles are recorded from the island of Saaremaa. Of these 3 are new for Estonia, namely, *Scolytus intricatus*, Ratz., from various deciduous trees, and *Pityophthorus lichtensteini*, Ratz., and *Ips austriacus*, Wachtl, for which the authors consider *I.* (*Pityogenes*) *trepanatus*, Nördl., to be the correct name, both from pines.

ZOLK (K.). **Metsakahjurite esinemine Eestis 1934. a.** [Forest Pests in Estonia in 1934.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 35 ; repr. from *Estländ forstw. Jb.* **7** pp. 614–640, 9 figs. Tartu, 1935. (With a Summary in German.) [Recd. April 1936.]

In 1934 the entomological experimental station of Tartu university began collecting data on forest pests in Estonia. Those recorded include : *Melolontha hippocastani*, F., the larvae of which injured the roots of conifers, especially in sandy soil ; *Saperda carcharias*, L., on poplar and willow ; *Agelastica alni*, L., often abundant on alder ; *Pissodes* *piniphilus,* Hbst., and *Hylobius abietis,* L., on pines, the latter causing much injury in young plantations ; *Ips typographus,* L., which is common, and *I. amitinus,* Eich., which only became abundant in 1932 and 1933, both usually on spruce but occasionally on pine ; *I. duplicatus,* Sahlb., which usually infested weakened trees, but was found in healthy ones during an outbreak in 1934 ; *Myelophilus* (*Blastophagus*) *piniperda,* L., and *M.* (*B.*) *minor,* Htg., on pines ; *Xyloterus signatus,* F., and *X. lineatus,* Ol., which infested felled trunks ; *Hylesinus* (*Leperisinus*) *fraxini,* Panz., which fed for maturation and hibernation in living ash trees and made brood mines in dead or injured ones ; *Polygraphus poligraphus,* L., which preferred unhealthy or dead spruce ; *Lygaeonematus abietinus,* Christ, on spruce ; *Phyllotoma nemorata,* Fall., on birch ; *Coleophora laricella,* Hb., on larch ; *Stenolechia gemmella,* L., which was not common, and *Tortrix viridana,* L., on oaks ; *Operophtera fagata,* Scharfenb. (*Cheimatobia boreata,* Hb.), which defoliated birch, and more rarely other deciduous trees ; *Erannis defoliaria,* Cl., which only became abundant in 1933 when it defoliated lime, hazel and elm ; *Rhyacionia* (*Evetria*) *buoliana,* Schiff., *R.* (*E.*) *resinella,* L., and *Dendrolimus pini,* L., on pines ; and the Aphid, *Chermes* (*Aphrastasia*) *pectinatae,* Cholod.

ZOLK (K.). **Külviaeg rootsi kärbse** (*Oscinella frit* **L.**) **hävitustöö reguleerijana.** [On the Influence of the Date of Sowing on Infestation by the Frit Fly.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 36, repr. 7 pp., 2 maps, from *Agronoomia* 1935 no. 12. Tartu, 1936. (With a Summary in German.)

In the autumn of 1934 *Oscinella frit,* L., did much harm to winter cereals in Estonia [*R.A.E.*, A **23** 228], the injury being especially severe to oats and barley in the north. To ascertain the safe date for sowing winter rye in 1935, daily catches were made and sowing was postponed until the catches decreased. The sowing dates given were 3rd September for the north and a week later for the south. Infestation was very slight in rye sown after these dates whereas it amounted to 40–100 per cent. in rye sown in August.

ZOLK (K.) **Rootsi kärbse osatähtsus rukkikulvi mitteteostamises 1935. a.** [The Postponement and partial Omission of Rye Sowing in Connection with Danger from the Frit Fly.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 37, repr. 6 pp., from *Agronoomia* 1936 no. 3. Tartu, 1936. (With a Summary in German.)

The percentage of infestation by *Oscinella frit,* L., of rye sown in Estonia before the safe date in 1935 [see preceding paper] was more than 10 times as great as the percentage of reduction of cultivation that resulted from delayed sowing.

WILCOX (J.), MOTE (D. C.) & CHILDS (L.). **The Root-weevils injurious to Strawberries in Oregon.**—*Sta. Bull. Ore. agric. Exp. Sta.* no. 330, 109 pp., 13 figs., 225 refs. Corvallis, Ore., June 1934. [Recd. April 1936.]

An account is given of the bionomics and control of the root-weevils attacking strawberries in Oregon, based on studies carried out from

1926 to 1931 and on the extensive literature. The most important species were *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., *O.* (*B.*) *sulcatus*, F., *O.* (*B.*) *rugosostriatus*, Goeze, and *Dyslobus decoratus*, Lec. (the last two of which were previously recorded in error as *O.* (*B.*) *rugifrons*, Gyll., and *D. granicollis*, Lec., respectively [*R.A.E.*, A **16** 23, 24]), *D. ursinus*, Horn, and *D. wilcoxi*, Van Dyke. The injury caused is similar in each case. The larvae feed on the roots, which are cut off, girdled or split longitudinally, and they also girdle and burrow into the crowns. The adults feed on the leaves, giving them a ragged appearance, and also on the stems and occasionally on the fruit. *O. ovatus* and *O. sulcatus* are parthenogenetic, and only females are produced. No males of *O. rugosostriatus*, *D. decoratus* or *D. ursinus* have been found among the thousands of individuals examined, and these species are also probably parthenogenetic. About equal numbers of males and females of *D. wilcoxi* were found.

The distribution of the genera *Otiorrhynchus* and *Dyslobus* is reviewed, and keys are given to the immature and adult stages of the various genera and species of weevils found on strawberry in Oregon. The control of the species of *Otiorrhynchus* is discussed under the headings of natural control (climate, soil types, parasites and predators), cultural control and artificial control by means of traps, fumigants, sprays and baits, etc. The injury caused to strawberry and other crops, the food-plants and distribution, immature and adult stages, seasonal history, and data on the life-history and control of each species are described. The history of the occurrence of *O. ovatus* in North America and its world distribution are briefly outlined. Previous work on the control of root-weevils with various poison baits is reviewed and the methods of preparing and applying some of them described. Similar experiments that were undertaken in Oregon in 1927–30 are described and the results tabulated.

Data on the life-history of the 3 species of *Otiorrhynchus* have already been noticed [**16** 23 ; **21** 194]. No data were obtained on the bionomics of *D. wilcoxi*, as it was assumed to be *D. decoratus* and was not identified as a new species until 1933. The life-histories of *D. decoratus* and *D. ursinus* are very similar. The larvae burrow into the crowns of the plants much more than do the species of *Otiorrhynchus*. They feed most intensely in June and July when the plants are not so resistant to attack, and therefore more plants are killed by the larvae of this genus even although they usually occur in fewer numbers. The adults overwinter in pupal cells at a depth of 1–3 ins. in the soil around the plants. They emerge about 1st March but do not begin to feed actively for 7–10 days. The eggs are laid from April to June, and in cages were found either singly or in groups of 50–60 either loose or on or under clods of soil, or on leaves. In the field they were found in dried hollow runners or leaf stems, either singly or several placed in a row, sometimes up to 4 ins. from the crown. Single eggs were frequently found on dried leaf stems or on scales around the crown or occasionally on a leaf or stem. The larvae pupate in August and September. Most of the adults are dead by June although a few may live through the summer and a second winter. A few larvae from eggs that were laid late in the season may overwinter. In 1929 about 40 per cent. of the adults of *D. decoratus* were parasitised by a Nematode. Moles destroy the larvae, but their burrowing also tends to kill the plants.

Of the various insect poisons tested, calcium arsenate and sodium fluosilicate in bran and apple baits gave the most consistently good results [*cf.* **16** 23]. The following formula for the bran bait proved the most satisfactory : 50 lb. bran, 5 U.S. gals. water, 10 lb. sugar, and 5 lb. poison, used at the rate of 100 lb. to 1–3 acres depending on how closely the plants are set. The three species of *Otiorrhynchus* can be controlled by an application of bait given when 75–90 per cent. of the adults have emerged, which is usually at about harvest time. At higher altitudes and in climates colder than in the Willamette valley it will be necessary to make a second application against the overwintering adults in April or May at about blossoming time. The bait should be applied about 1st April against *Dyslobus* spp. The apple baits appear to be better adapted to control the weevils of this genus, although the bran bait with sodium fluosilicate as the poison has given very satisfactory control when applied in early April and followed by several days of clear weather.

Other weevils found on strawberries were *D. granicollis*, *D. simplex*, Van Dyke, *Plinthodes taeniatus*, Lec., *Sciopithes obscurus*, Horn, *Panscopus torpidus*, Lec., and *Geoderces* sp. near *puncticollis*, Casey, which are thought to be potential pests ; and *Trigonoscuta pilosa*, Mots., *Thricolepis inornata*, Horn, *Sitona hispidula*, F., and *Cleonus kirbyi*, Casey, which are thought to be of little importance.

THOMPSON (W. L.). **Lime-sulfur Sprays for the combined Control of Purple Scale and Rust Mites.**—*Bull. Fla agric. Exp. Sta.* no. 282, 38 pp., 5 refs. Gainesville, Fla, July 1935. [Recd. April 1936.]

On *Citrus* in Florida the purple scale [*Lepidosaphes beckii*, Newm.] is usually controlled by oil emulsions, and the rust mite [*Phyllocoptes oleivorus*, Ashm.] by dusting sulphur, but in 1930–34, experiments were carried out with sprays of lime-sulphur for the combined control of both these pests. As scale insects and mites are more difficult to control on trees that have been sprayed with Bordeaux mixture, many growers omit to apply the latter against the fungi causing melanose and scab with the result that much second grade fruit is produced. In 1932–34, therefore, some experiments were carried out with lime-sulphur following Bordeaux mixture. Lime-sulphur (1 : 40) applied 3 times at intervals of 6 weeks or longer reduced the numbers of scales and controlled rust mites for 7–10 months. Infestations of the scale were held in check or reduced by sprays of lime-sulphur (1 : 40–60) applied on 11th April, 11th May and 25th June 1934 following an application of Bordeaux mixture (3 : 4 : 50) on 18th–19th January. Less reduction in the numbers of scales was obtained when the first application of lime-sulphur was made on 11th May instead of 11th April. The percentage of increase of purple scale was greater when lime-sulphur sprays followed an application of Bordeaux mixture at a strength of 3 : 3 : 50 than one at 1½ : 1½ : 50. On plots receiving Bordeaux mixture (1½ : 2 : 50) on 9th April, practically the same percentage control of scales was given by 2 applications of lime-sulphur (1 : 40) on 24th April and 7th May as by one application of a 1 per cent. oil emulsion on 1st June. A greater reduction in the numbers of purple scale was obtained when lime-sulphur or oil emulsion followed basic copper sulphate than when it followed Bordeaux mixture. Liquid or dry lime-sulphur with wettable sulphur (5 lb. per 100 U.S. gals. spray mixture) or bentonite sulphur (4–6 lb. per 100 U.S. gals.) gave better control of scales and mites than liquid lime-sulphur used alone.

Britton (W. E.). **The Eastern Tent Caterpillar.**—*Bull. Conn. agric. Exp. Sta.* no. 378 pp. 61–82, 22 figs., 6 refs. New Haven, Conn., November 1935. [Recd. April 1936.]

The following is largely taken from the author's summary: Outbreaks of *Malacosoma americana*, F., occurred in Connecticut in 1902, 1913, 1924 and 1935. The larvae feed chiefly on wild cherries (*Prunus serotina*, *P. virginiana* and *P. pennsylvanica*) and apple but when very abundant also attack a variety of other trees and shrubs. The eggs are laid in June and July in clusters of 200 or more encircling the small twigs. The larvae hatch in the following April and spin nests in the forks of the branches in May. They mature in about 6 weeks and spin cocoons from which the adults emerge 2 weeks later. There is only one generation a year. This species is often confused with *M. disstria*, Hb. (forest tent caterpillar), *Hyphantria cunea*, Drury (fall webworm), and *Thyridopteryx ephemeraeformis*, Haw. (bagworm), the habits and some of the stages of which are described. It is usually controlled by the attacks of parasitic and predacious insects and birds and by a bacterial wilt disease.

Control measures consist in removing and burning the egg-clusters, removing the nests and destroying the larvae, burning the nests on the trees, which may, however, kill or injure the branches, and spraying with lead arsenate.

Lacroix (D. S.). **Insect Pests of Growing Tobacco in Connecticut.**—*Bull. Conn. agric. Exp. Sta.* no. 379 pp. 85–130, 44 figs., 16 refs. New Haven, Conn., December 1935. [Recd. April 1936.]

An account is given of the bionomics and control of the chief insect pests of tobacco in Connecticut, with a key for their identification, based partly on the injuries caused, and a calendar showing their seasonal occurrence and the necessary control measures. Notes are included on the mixing and application of baits and dust insecticides.

Turner (N.) & Townsend (J. F.). **Termite Control in Buildings in Connecticut.** *Bull. Conn. agric. Exp. Sta.* no. 382 pp. 205–242, 15 figs., 31 refs. New Haven, Conn., March 1936.

In view of the recent increase of injury to buildings by *Reticulitermes flavipes*, Kollar [*cf. R.A.E.*, A **23** 552] in Connecticut, the bionomics and control of subterranean termites of this type are discussed from the literature. Structural methods of excluding them from buildings are recommended with supplementary chemical measures. An appendix gives details of construction necessary to make a building proof against termites [*cf.* **17** 730; **20** 269; **21** 666, etc.] and outlines the alterations required to accomplish this in existing buildings.

Garman (P.) & Townsend (J. F.). **Control of the White Apple Leafhopper.**—*Circ. Conn. agric. Exp. Sta.* no. 111 pp. 37–47, 8 figs., 2 refs. New Haven, Conn., March 1936.

The results are recorded of investigations carried out in Connecticut in 1932–34 on the bionomics and control of *Typhlocyba pomaria*, McAtee, on apple [*R.A.E.*, A **21** 512; **22** 399; **23** 552]. In 1935, there was very little difference in the percentage of nymphs killed on trees sprayed with nicotine sulphate (1 : 800) alone and those sprayed with nicotine sulphate and soap. Pyrethrum soaps have given satisfactory control in some tests, but in general both pyrethrum and derris or rotenone sprays have not been so efficient as nicotine sulphate or anabasine sulphate. No spray or dust has proved satisfactory against the adults in the field. A combined spray of ½–¾ pint nicotine sulphate in 100 gals. summer (white) oil emulsion has been satisfactory against the leafhopper and the European red mite [*Paratetranychus pilosus*, C. & F.], but it has the disadvantage of " setting " any arsenical residue present on the fruit. It is probably safe to use it on winter varieties until early September, if the residues from previous sprays have been washed off by rain. It should not be used late, however, on varieties that have a conspicuous bloom. Sprays of ground derris root showed some promise for the combined control of these pests. Nicotine sulphate with the addition of soap, however, is probably the best spray that can be applied after 7th September.

To determine whether sprays are required or not, the undersides of the leaves, except the young terminal ones, should be examined in late May or early June. An infestation of 50 nymphs of the first generation and more than 200 of the second generation to 100 leaves may usually be regarded as dangerous. When there are more than 4 nymphs of the second generation to a leaf, spraying should be carried out to prevent spotting of the fruit. All sprays should be applied thoroughly to the underside of the leaves. The author gives figures to show that the cost of spraying would be much less than the loss in value due to the spotting of the fruit.

The following spray programme is recommended for Connecticut: For heavy infestations of more than 50 nymphs to 100 leaves in May and June, nicotine sulphate (1 : 800) should be added to the calyx, and first and second cover sprays applied between 25th May and 7th June. For populations of 2–5 and more than 5 nymphs to a leaf in August and September nicotine sulphate (1 : 1,600) and (1 : 800), respectively, should be applied between 25th August and 7th September. For light infestations of 50 nymphs or less to 100 leaves in May and June and 200 or less in August and September no spraying is necessary. In the case of a heavy infestation it may not be necessary to spray both in spring and autumn. This will depend on the degree of control obtained in the spring and the numbers of leaf-hoppers developing on the leaves in August and September as well as on the extent of migration from neighbouring trees early in the season. When there is no migration it will probably be advisable to add nicotine sulphate to the calyx and second cover sprays. If the infestation is light in one part of the orchard and heavy in others, it is only necessary to spray the latter. In small plantations no late treatment is advisable, and spotted fruit can be cleaned by wiping with a damp cloth.

CHRISTIE (J. R.). **Life History of *Agamermis decaudata*, a Nematode Parasite of Grasshoppers and other Insects.**—*J. agric. Res.* **52** no. 3 pp. 161–198, 20 figs., 22 refs. Washington, D.C., 1936.

An account is given of studies on the bionomics of *Agamermis decaudata*, Cobb, Steiner & Christie, in Virginia where it infests grasshoppers and other insects [*cf. R.A.E.*, A **11** 361], and of the morphology and internal anatomy of its larval stages.

The adults oviposit in the soil, the average number of eggs laid by a female being about 10,000. The eggs may be classified in two groups according to size, deposited by females 3–12 and 15–46·5 cm. long, respectively. Some hatching occurs in the winter and early spring, but the greater part takes place from late June to mid-July. Larvae of two lengths emerge according to the size of the egg, but rearing experiments appear to indicate that these are one species, as the smaller type produced adults 16·5 and 35 cm. long. Observations made at night showed that the grasshopper nymphs rest on the plants and not on the ground ; it is therefore probable that the larvae of *A. decaudata* climb the vegetation to infest them when it is wet with dew or rain. In 88 experiments in infesting first-instar nymphs of *Melanoplus femur-rubrum*, DeG., 58 per cent. of 519 larvae succeeded in entering. If infested nymphs are rendered inactive by low temperature, the development of the Nematode larvae is retarded. All those dissected at a given time of the year from grasshoppers taken in a given locality tended to be in the same stage of development. The parasitic larval stage lasts about 1–1½ months for males and about 2–3 months for females ; the host usually dies when the Mermithid emerges. Grasshoppers generally harbour only one parasite, which does not cause any external difference in structure, but often renders the females sterile though it does not thus affect the males. Infestation retarded the development of grasshoppers to a marked degree. In the field males of *A. decaudata* are more numerous than females, but a very low proportion of males emerged from grasshoppers in cages. It is therefore probable that the other insects that harbour this parasite (such as *Ceratomegilla fuscilabris*, Muls., and *Draeculacephala mollipes*, Say) contribute to the development of the males. Dissections of over 3,000 grasshoppers, mostly the Acridid, *M. femur-rubrum*, and the Tettigoniids, *Orchelimum vulgare*, Harr., and *Conocephalus brevipennis*, Scud., showed that the percentages of infested males and females of Acridids were 10·7 and 10·2 respectively, and of Tettigoniids 19·6 and 14·6. On leaving the host the females penetrate the soil to a depth of 2–6 ins., where they moult and complete their larval stage in 9–11 months, from about September to July. The post-parasitic stage of the males is apparently similar. Pairing occurs in the soil, and oviposition, which begins about a year after emergence from the host, continues through two summers although it ceases each winter. In experiments the females did not survive a third winter. A larva that matures in the late summer will ordinarily remain in the egg until the following spring.

CUSHMAN (R. A.). **New Ichneumon-flies.**—*J. Wash. Acad. Sci.* **25** no. 12 pp. 547–564, 2 figs., 2 refs. Menasha, Wis., 15th December 1935. [Recd. April 1936.]

In addition to descriptions of a new genus and 13 new species of Ichneumonids from the United States, this paper includes some notes on synonymy, with a few generic transfers, and a key to the North American species of *Neliopisthus*. The new species are *Oocenteter* (gen. n.) *tomostethi*, *Microcryptus* (*Aptesis*) *ferrugineus* and *Perilissus tomostethi*, from *Tomostethus multicinctus*, Rohw. ; *Lissonota recurvariae*, *Neliopisthus piceae* and *Phaedroctonus piceae*, from *Recurvaria piceaella*, Kearf. ; *P. epinotiae*, from *Enarmonia* (*Epinotia*) *nanana*, Treits. ; *Phaeogenes epinotiae*, from *E. nanana* and *R. piceaella* ; *Cremastus grapholithae*, from *Cydia* (*Grapholitha*) *molesta*, Busck ; *Phaedroctonus* *temporalis*, from *C.* (*Laspeyresia*) *youngana*, Kearf.; *Cremastus chilonis*, from *Chilo forbesellus*, Fern.; *Cremastus protractus* from *Coleophora* sp.; and *N. longicauda*, the host of which is not given.

FROST (S. W.). **A Summary of Insects attracted to Liquid Baits.**—*Ent. News* **47** nos. 3–4 pp. 64–68, 89–92, 3 refs. Philadelphia, Pa, March–April 1936.

This paper contains notes on the miscellaneous insects taken in Pennsylvania in baits containing various chemicals tested during trapping experiments for the oriental fruit moth [*Cydia molesta*, Busck] in 1933 and 1934 [*cf. R.A.E.*, A **23** 52, 458]. A table shows the numbers and identities of the insects taken by each bait.

KUTCHKA (G. M.). **The probable Distribution of Termites through Greenhouse Plants.**—*Bull. Brooklyn ent. Soc.* **31** no. 2 pp. 45–48, 10 refs. Lancaster, Pa, April 1936.

In December 1934, 110 workers and 3 soldiers of *Reticulitermes flavipes*, Kollar, were taken from the pot of a large *Poinsettia* recently brought into a house. They had probably entered the pot through the drain hole from an infested board and lived on the small particles of wood and cellulose in the soil. Transportation by such means may account for their distribution in some cases.

MOULTON (D.). **New American Thysanoptera.**—*Bull. Brooklyn ent. Soc.* **31** no. 2 pp. 61–65. Lancaster, Pa, April 1936.

Six new species of thrips are described, including *Frankliniella spinosus*, sp. n., from maize in Mexico, and *F. inornatus*, sp. n., from the flowers of mango (*Mangifera indica*), in Cuba.

ROBÁ (R. P.). **El minador de las hojas del cafeto : *Leucoptera coffeella*, Guér.** [The Coffee Leaf-miner, *L. coffeella*.]—*Bol. agríc.* **9** no. 210 pp. 476–483, 6 figs., 12 refs. Medellín, January 1936. [Recd. April 1936.]

As little information has been published on the coffee leaf-miner, *Leucoptera coffeella*, Guér., in Colombia, an account is given of its bionomics and control, mostly from the literature [*R.A.E.*, A **22** 155, etc.]. In Colombia at about 4,000 ft. the egg stage lasted 6–7 days, the larval 25–40, and the pupal 10–12. The maximum number of eggs on a leaf was 5, and in 50 per cent. of the infested leaves there was only 1 egg. This moth is not an important pest of coffee in Colombia.

MARCHIONATTO (J. B.). **El hongo " Corona Blanca " (*Cephalosporium lecanii* Zimm.) en la región rioplatense.** [The Fungus, *C. lecanii*, in the River Plate Region.]—*Rev. sudamer. Bot.* **2** no. 6 pp. 153–155, 1 fig., 1 pl. Montevideo, December 1935. (With a Summary in German.) [Recd. April 1936.]

In a previous paper, *Cephalosporium lecanii* was recorded from several Coccids in Argentina [*R.A.E.*, A **23** 12]. Subsequently, specimens of *Lecanium perinflatum*, Ckll., attacked by this fungus have been received from the province of Santa Fé, and it is stated also to be the chief natural enemy of this scale in Uruguay.

FRANSSEN (C. J. H.) & TIGGELOVEND (L. M. J.). **De vijanden en ziekten van de Orchideeën op Java en hunne bestrijding.** [The Pests and Diseases of Orchids in Java and their Control.]—84 pp., 1 pl., text-ill. Batavia, G. Kolff & Co., 1935. [Recd. May 1936.]

The greater part of this book deals with the insect pests of orchids in Java. In each case a very brief description is given, together with notes on bionomics, injury caused and control. Keys are given to the species dealt with, based on the kind of injury caused.

VAN DER MEER MOHR (J. C.). **Plagen der tabak.** [Pests of Tobacco.] —*Meded. Deli Proefst.* (2) no. 93 pp. 12–20. Medan, 1936.

Notes are given on the incidence in 1935 of a number of pests of tobacco in Deli, Sumatra ; the species concerned have already been noticed from previous reports [*R.A.E.*, A **21** 274, 361 ; **22** 201].

GARDNER (J. C. M.). **Note on Cutworms damaging Deodar Seedlings.**—*Indian For.* **61** no. 5 p. 327. Calcutta, May 1935. [Recd. April 1936.]

During recent years, serious damage to seedlings of deodar [*Cedrus deodara*] by cutworms has been reported from the Punjab and United Provinces. Investigations made in nurseries in the Chakrata division of the United Provinces, particularly at Mundali, in 1933–34 showed that some of the injury attributed to cutworms had been caused by cockchafer grubs, which had severed or damaged the roots below ground level [*cf. R.A.E.*, A **24** 98], and in other cases the roots had probably been injured during transplanting. Three species of Noctuids have been reared from larvae taken in seed-beds, but *Agrotis ypsilon*, Hfn., has not yet been obtained. The normal food of cutworms in deodar forests is grass and weeds, and deodar is probably only eaten when nothing else is available. Damage can, therefore, be prevented by keeping the nursery site and beds free from weeds when oviposition is taking place. Moths of the overwintered generation emerge in May, but there are probably at least two generations a year. Weeding should be carried out from the end of August at Mundali, where the seed is sown late in the year, to ensure the absence of cutworms during germination. Attack is usually severe in new seed-beds that have been weeded just before sowing, and light in sites that have been clear of weeds for a long time. When sweetened poison baits containing arsenic were used on a small scale at Mundali against the larvae slightly beneficial results were obtained.

UCHIDA (Toichi). **Drei neue Gattungen sowie acht neue und fuenf unbeschriebene Arten der Ichneumoniden aus Japan.** [Three new Genera and eight new Species of Ichneumonids from Japan, with five unrecorded Species.]—*Insecta matsum.* **10** no. 3 pp. 111–122, 6 figs. Sapporo, March 1936.

The new species described include *Microcryptus setiferae* reared from *Diprion* (*Neodiprion*) *sertifer*, Geoffr., *Omorgus alsophilae* from *Alsophila tenuis*, Btlr., and *Perilissus athaliae* from *Athalia rosae japonensis*, Rohw., all in Japan. *Erigorgus fibulator*, Grav., form *coreanus*, n., is described from *Agrotis* (*Rhyacia*) *ypsilon*, Hfn., in Korea.

Mimeur (J. M.). **Aphididae du Maroc. (Septième note.)**—*Bull. Soc. Sci. nat. Maroc* **15** pp. 251–258, 4 figs., 2 refs. Rabat, 1936. **Plantes hotes des Aphididae du Maroc (Additions à la première liste.)**—*T.c.* pp. 259–260, 1 ref.

The Aphids recorded in the first paper include *Cinara cedri*, sp. n., of which the winged and wingless viviparous females and male are described, from *Cedrus atlantica.* The second comprises a list of food-plants of Moroccan Aphids, supplementing one that appeared in a paper already noticed [*R.A.E.*, A **23** 115].

Report of Proceedings of the Inter-State Locust Conference, Pretoria, 30th July to 3rd August, 1934.—Fol., 116 pp., 7 maps, 8 pls. Pietermaritzburg, 1935. Price 1*s.*

This Conference was attended by delegates from Angola, Basutoland, Bechuanaland Protectorate, Belgian Congo, Northern Rhodesia, Portuguese East Africa, Southern Rhodesia, Swaziland, Tanganyika, Kenya and Uganda, and the Union of South Africa and South-West Africa.

The papers read are arranged in two sections dealing respectively with administration and policy concerning recent outbreaks and invasions, and scientific locust research with particular reference to methods of destruction. The following are brief summaries of them and of resolutions associated with them :—

In Harrison (E.) East Africa (Tanganyika, Kenya and Uganda) (pp. 10–11), and The Red Locust Invasion of East Africa during December 1933 to July 1934 (pp. 11–12), three species of locusts, *Schistocerca gregaria*, Forsk., *Locusta migratoria migratorioides*, R. & F., and *Nomadacris septemfasciata*, Serv., which have appeared consecutively in British East Africa since 1928 are mentioned, and an outline of the invasion by the last species is given. The policy adopted in control, which consists of the defence of all growing crops by destroying hoppers in their neighbourhood, is explained. Since 1928, £250,000 has been spent on materials and transport, but the value of voluntary control work must amount to several times that figure. The total obliteration of swarms during an outbreak is considered to be impossible and is not attempted.

In Allan (W.) The Swarming of the Red Locust in Northern Rhodesia (pp. 13–16), an account is given of the movements and breeding of *Nomadacris* in that country from 1927 to 1934, and a summary of the author's observations on the relation of flight and temperature is included. During the winter months, most swarms leave Northern Rhodesia, and the remaining ones are inactive, for *Nomadacris* flies strongly only when the shade temperature rises above 78°F. The extremely rapid and prolonged flight of swarms observed in Northern Rhodesia during the pre-breeding return migration in October and later is probably due to temperatures of 90°F. and over occurring at that time.

In de Barros Queiroz (J.) The Locust Situation in Angola (pp. 16–19, map annexure A), an outline of the locust invasion since 1931, when swarms of *Nomadacris* entered the country, is given ; *Locusta* was also present, though in smaller numbers. During 1933–34, the campaign cost £10,000, and control measures included flame-throwers and spraying with a 5–7 per cent. solution of sodium arsenite.

Spraying with sodium hydroxide and use of poisoned sugar-cane and chaff as bait were not successful. Natural enemies of the hoppers included a Tettigoniid, *Acanthoplus discoidalis*, Wlk.

In Reilly (R.) Bechuanaland Protectorate (pp. 19–20), it is stated that the whole of the Protectorate was invaded by *Nomadacris* in 1933–34, and 50 per cent. of the crops were lost in Ngamiland.

In Jack (R. W.) Locusts in Southern Rhodesia (pp. 20–24, map annexure B), the invasions of that country by *Locustana pardalina*, Wlk., *Nomadacris* and *Locusta* are outlined [*cf. R.A.E.*, A **21** 673; **22** 708]. During the 1933–34 campaign, which cost £27,000, 7,000 spraying pumps were in operation, and 212 tons of sodium arsenite and 6,000 gallons of cattle dip were used.

In Seydel (C.) Belgian Congo (pp. 24–25) it is stated that *Nomadacris* first appeared there in 1930, since when it has been constantly present in Katanga. There is no special staff to deal with locusts, but hoppers are destroyed in the course of crop protection.

In Cardoso (A.) The Locust Invasions in Portuguese East Africa (pp. 25–27, map annexure C), the invasion of Mozambique by *Locustana* in 1924 is mentioned, and the movements and breeding of *Locusta* and *Nomadacris* in 1932–34 are described.

In Cardoso (A.) and Frias (D.) Collection of Information and Methods of Destruction employed in the anti-locust Campaigns in 1932, 1933 and 1934 in the Colony of Mozambique (pp. 27–31), the usual mechanical and chemical control methods used are described. A spray of 0·2–0·5 per cent. sodium fluosilicate gave good results on caged locusts, and spraying with formalin stunned but did not kill them.

The information in Summary of Locust Invasion of Nyasaland from January 1932–June 1934 (pp. 31–32), has already been noticed [**22** 666; **23** 503].

In Elder (W. A.) Swaziland (pp. 32–33), the invasion by *Nomadacris*, which started late in 1933, and the campaign, which cost £4,700, are outlined.

In Verney (F. A.) Basutoland (p. 33), it is stated that *Locustana* was occurring along the Caledon river, but that swarms of *Nomadacris* were no longer present.

In Wilkens (W.) The Field Organisation of the Campaign against the Red and Brown Locusts in the Union during 1933–34 (pp. 33–36), a description is given of the invasions of *Nomadacris* and *Locustana* and the organisation of control. Destruction was carried out mainly by sodium arsenite in liquid or powder form, an equivalent of 2,400 tons of which had been used by the end of April 1934. Against *Nomadacris* the only effective bait was bagasse (cane fibre) mixed with molasses.

In Joubert (M. J.) Head Office Administration of the 1933–34 Locust Campaign in the Union (pp. 36–38), it is stated that £1,213,303 was spent on locust destruction from 1920 to 1933, and £580,000 from November 1933 to June 1934. Over 35,000 pumps, about 3,000 tons of sodium arsenite and 49,000 gallons of kerosene were used in the campaign. The high expenditure was justified by the value of the crops saved.

Most of the information contained in Faure (Jacobus C.) The Red Locust Invasion of the Union 1933–34 (pp. 38–40, map annexure D), and Outbreak of the Brown Locust in 1933–34 (pp. 40–43, map annexure E), has been noticed elsewhere [**23** 503; **22** 707].

It was resolved (pp. 111–112) that in practically all the States and Territories represented successful efforts were made to deal with the locust menace by protecting the crops ; the fact that varying conditions necessitated varying methods of destruction was recognised.

In Lea (A.) The Use of Calcium Arsenate for Locust Destruction in the Sugar Cane Belt (pp. 46–50) and Investigations on the Red Locust in Natal in 1934 (pp. 50–62), particulars are given of the biology of *Nomadacris* in sugar-cane fields, where the conditions are ideal for larval development. The adults bred there did not develop the full ph. *gregaria* characteristics, were less active and undertook shorter flights than locusts bred in the bush country. In the control of hoppers, poisoned baits prepared with a 4 per cent. suspension of sodium fluosilicate were more effective than those with 4 per cent. sodium fluoride, 0·5 per cent. sodium arsenite or 0·5 per cent. calcium arsenate, but in general baits were not effective in the cane fields. For sprays, sodium arsenite was the most effective poison, but it scorched and checked the growth of the sugar-cane and reduced its sucrose content. A 2 per cent. spray of sodium fluosilicate, although cheaper and not injurious to the cane, was less toxic to the older hoppers than 0·5 per cent. sodium arsenite. Sprays of 0·5 to 0·6 per cent. calcium arsenate in 5 per cent. molasses solution can be used successfully against all instars ; since they are not injurious to sugar-cane, the latter remains green and attractive to further invading hoppers for some time. In general, hoppers can be most effectively controlled in cane fields by a judicious use of sodium arsenite for all methods of poisoning, and calcium arsenate as a stomach poison.

Against adult locusts, baits prepared with chaffed young canes soaked for 12 hours in 1 per cent. solution of sodium arsenite gave good results. Of sawdust, shredded fresh cane and bran, used as bases for bait, bran seemed the most attractive ; good results were also obtained with bagasse. In cage experiments baits containing 1 per cent. by weight of sodium arsenite and calcium arsenate, gave 98 and 94 per cent. mortality respectively ; over the same period baits with 2 per cent. sodium fluosilicate and 2 per cent. sodium fluoride gave 72 and 64 per cent. mortality. In a large scale field experiment on spraying adults with a 1·2 per cent. suspension of calcium arsenate in a 5 per cent. solution of molasses, the mortality was 20–30 per cent. ; the cost was 6–7 shillings per acre and, for the results achieved, prohibitive.

In Faure (Jacobus C.) The Addition of Spreaders to Arsenite of Soda for Locust Destruction (pp. 62–64), it is stated that in contact sprays the arsenite content can be reduced if soap, which greatly increases their effectiveness, is added. It is recommended to use 0·3 per cent. sodium arsenite with the addition of enough soap to give 0·25 per cent. fatty acid for large hoppers and adults ; for young hoppers it is sufficient to use 0·1 to 0·2 per cent. of poison. Dextrin (0·25 per cent. in 0·3 per cent. sodium arsenite) also gave very encouraging results.

In Faure (Jacobus C.) Is Arsenite of Soda an Attractant for Locusts? (pp. 64–66, annexure H, fig. 1), field observations are recorded showing that arsenite is attractive to hoppers of *Locustana*, which congregate on bare patches dusted with dry sodium arsenite. There is no evidence that it is attractive to *Nomadacris* hoppers.

In de Villiers (F. J.) A Method for the quantitative Determination of the Distribution of Locust Poison (pp. 66–68), glass plates used for estimating the density on the ground of sodium arsenite dusted from an aeroplane are described ; each plate is 1 ft. square and has a roughened surface covered with a film of glycerine to which the particles of arsenite adhere.

In de Villiers (F. J.) Physical Analysis of Locust Poison Powder (pp. 68–71), the technique of grading arsenical powders by screening and air flotation methods is described, and the need of evolving a standard classification of powders used in locust control is stressed.

In Oldfield (J. F.) Existing Appliances used in Locust Destruction (pp. 71–73, annexures F, G), the spraying and dusting pumps and flame-throwers used during the last anti-locust campaign in South Africa are discussed, and various improvements in them are suggested.

It was resolved (p. 112) to recommend that fundamental studies on finding a substitute for sodium arsenite should be prosecuted in the Union of South Africa. Research should also be continued to standardise the materials and to improve the implements used in control. In the meantime, standards and specifications applying in the Union should be adopted by all States and Territories represented.

In Naudé (T. J.) Locust Control by Means of Aeroplanes (pp. 73–82, appendix I), a description of the apparatus used for dusting settled swarms with sodium arsenite from aeroplanes and of the actual tests are given. The results obtained have been summarised elsewhere [**23** 706].

It was resolved (p. 112) to recommend that since the experiments have produced promising results, this method should be further explored. The aeroplanes should also be used for scouting work, and States and Territories should facilitate aeroplane scouting by officers from neighbouring countries, especially along the boundaries.

After a discussion on hand collecting and mechanical means for combating locusts (pp. 83–84), it was resolved that such methods as hand collecting of eggs, their exposure by cultivation, and destruction of hoppers with the help of zinc barriers, can be usefully employed where local conditions make them practicable.

After a discussion on permanent breeding grounds (pp. 84–88), during which A. P. G. Michelmore expressed the opinion that those of *Nomadacris* are confined to grasslands and temporary swamps, the three known breeding grounds being Mweru wa Ntipa and Masanka Plain in Northern Rhodesia and Lake Rukwa in Tanganyika Territory, the Conference resolved (p. 113) that the finding of permanent breeding grounds is essential for locust control and the participating States and Territories should actively co-operate in field exploration. Maps of open grass country and of areas subject to flooding should be prepared, all this work being co-ordinated by the International Centre for Anti-Locust Research in London.

In Cardoso (A.) and Frias (D.) Notes for the biological Study of the Red Locust (pp. 88–93), particulars are given of the flight, pairing, oviposition and length of larval period of *Nomadacris*. The measurements and descriptions of colouration of larval instars and adults, as well as particulars of plants eaten and avoided, are included.

Faure (Jacobus C.) The Swarming of the Desert Locust in the Union and South West Africa in 1934 (pp. 93–96, annexure H, figs. 2–5), has been reviewed elsewhere [**22** 708].

In Allan (W.) The Occurrence of the Tropical Migratory Locust in Northern Rhodesia (p. 96), a short survey is given of the invasion and breeding in 1931–34 of the 8th–13th generations since the beginning of the present outbreak of *Locusta*.

Faure (Jacobus C.) The Occurrence of the Tropical Migratory Locust in the Union and South West Africa in 1933–34 (pp. 96–98), has been reviewed elsewhere [**22** 708].

It was resolved (p. 113) that further study of the bionomics of locusts, particularly with regard to the habits of overwintering swarms, is needed.

In Cardoso (A.) and Frias (D) The Study of the Natural Enemies of the Red Locust (pp. 98–102), is contained information that has been summarised elsewhere [**24** 3].

It was resolved (p. 114) that flies and fungi are the only natural enemies of locusts of practical importance. In view of the importance of *Empusa grylli* further research on it should be undertaken.

In Faure (Jacobus C.) Organisation on Locust Research in the Union (pp. 102–103), most of the information has already been noticed [**22** 707].

It was resolved (p. 114) that to avoid duplication, projects of specific lines of research should be forwarded to the Southern African Locust Bureau.

In the section dealing with the probable extent of 1934–35 invasions and outbreaks south of the equator, after a discussion (pp. 103–106), it was resolved (p. 114) that invasions are likely to be most severe in the south (Union of South Africa, Bechuanaland Protectorate and South-West Africa) and decreasingly so northwards.

In the sections on inter-state co-operation and plans for dealing with future outbreaks and invasions, after discussions (pp. 106–111) it was resolved (pp. 114–115) to establish a Southern African Locust Bureau, to be centralised in Pretoria, financed on a co-operative basis and controlled by a committee of members from the Union, Southern Rhodesia and Mozambique, its function being the collation, co-ordination and dissemination of locust information among the participating countries. The recommendations also include suggestions for inter-state co-operation along the boundaries and for next season's campaign.

KEY (K. H. L.). **Rate of Locomotion in Relation to Starvation in** *Locusta migratoria migratorioides* **(R. & F.) (Orthoptera).**—*Proc. R. ent. Soc. Lond.* (A) **11** pt. 1–2 pp. 3–6, 2 figs., 5 refs. London, 31st March 1936.

A special apparatus, which is described, was devised for measuring the speed of crawling adults of *Locusta migratoria migratorioides*, R. & F., under the directing influence of a beam of light. Insects subjected to periods of starvation of up to 98 hours moved at the same average rate as normal control locusts, *viz.*, 4·44 cms. per second at 27°C. [80·6°F.].

RUBTZOV (I. A.). **Рубцов (И. А.). Regularities in the Development and Behaviour of Siberian Acrididae in Connection with Climatic Factors.** [*In Russian.*]—*Bull. Acad. Sci. URSS.* 1935 pp. 789–824, 3 figs., 21 refs. Moscow, 1935.

Observations in the laboratory and in the field were carried out in Eastern Siberia in 1932–33 to ascertain the dependence of the behaviour and general biology of grasshoppers on different climatic factors and their combinations.

It was found that hatching depends mainly on temperature and humidity. It begins at 18–19°C. [64·4–66·2°F.], but the optimum temperatures are 29°C. [84·2°F.] for *Aeropus sibiricus*, L., and 25–27°C. [77–80·6°F.] for *Chorthippus albomarginatus*, DeG., and *Stenobothrus* spp. Humidity is necessary to stimulate hatching, and spring rains are favourable to the simultaneous mass appearance of hoppers. Experiments with sharp temperature fluctuations showed that the cooling of eggs for periods of 10 minutes at temperatures down to −20°C. [−4°F.] reduced the percentage of successful hatchings, and delayed hatching by 4–5 days, but that spring frosts cannot kill all the eggs. The embryos are very resistant to high temperatures up to 45°C. [113°F.], above which the hatching is delayed, but are killed at 54–55°C. [129·2–131°F.]. The spring burning of the grasses, usually practised in Eastern Siberia, does not raise the temperature of the soil in overgrazed areas with scarce vegetation cover, in which the eggs of *A. sibiricus* and *C. albomarginatus* are concentrated, by more than 16–26°C. [28·8–46·8°F.], so that it is not fatal to the eggs. Moulting is stimulated by humidity and reaches its maximum at humidities of 70–80 per cent. and temperatures of 24–26°C. [75·2–78·8°F.]. At 0°C. [32°F.] newly hatched hoppers and adults of *A. sibiricus* and *C. albomarginatus* can survive without food for about a month and a fortnight respectively ; at 24–26°C. they can do so for only 3–4 and 4–5 days. In *A. sibiricus* the threshold of development is about 10°C. [50°F.], and embryonic development lasts 796 hours at 12–13°C. [53·6–55·4°F.]. At about 28°C. [82·4°F.] embryonic and larval development last 162 and 507 hours respectively ; in general the larvae develop successfully only above 19°C. [66·2°F.], and more rapidly at fluctuating than at constant temperatures.

Particulars are given of temperature limits for different zones of activity, which differ but little in different species and instars of Siberian grasshoppers. The lethal low temperature for first instar hoppers is about −13°C. [8·6°F.] for *A. sibiricus*, −11°C. [12·2°F.] for *C. albomarginatus* and −7°C. [19·4°F.] for *Arcyptera microptera microptera*, F. W., so that May frost can be an important controlling factor. The zone of normal activity lies between 20°C. [68°F.] and 31°C. [87·8°F.], and the optimum temperature for all instars is 25–26°C. [77–78·8°F.]. The lethal high temperature is about 50°C. [122°F.]. Feeding begins at 10°C., becomes general at 18°C. [64·4°F.] and 70 per cent. humidity, reaches a maximum at 24–26°C. and 50–60 per cent. humidity and ceases at 32°C. [89·6°F.]. In the evening it terminates at 18°C.

The effect of different climatic factors on the ascent of and descent from plants by the grasshoppers has been studied. The upward vertical migration at the end of the day is determined by the evening inversion of temperature, when the air at the surface of the ground becomes cooler than that above it ; if the inversion does not occur till the temperature has fallen below 10–12°C., the grasshoppers remain on the ground. The ascent is stimulated by the rise in relative humidity of the air, particularly when the inversion of temperature causes the humidity to decrease from the ground upwards, and is the most pronounced at 15–20°C. [59–68°F.] and humidities over 90 per cent. The morning descent occurs after the inversion of temperature is replaced by its normal distribution, and commences at 8–9°C. [46·4–48·2°F.] in sunny and at 10–15°C. [50–59°F.] in cloudy weather ; the more rapid the morning fall in relative humidity, the quicker is the descent from the plants. The ascent of the plants during the day is due to negative thermotaxis, and it occurs when the temperature of the air at the ground reaches 40–45°C. [104–113°F.].

Most of the gregarious species of grasshoppers in Siberia undertake definite horizontal migrations in the course of their life-history. In the first instar, the hoppers are concentrated on the dry higher ground, where the bulk of the eggs has been laid ; from the second instar, they tend to move to the more humid low-lying areas, invading the cultivated fields, and remain there until the adult stage. Observations on such movements as affected by weather are recorded ; the descent to lower ground is in general hastened by dry weather and retarded by rainfall. Before oviposition in July the grasshoppers return to the dry higher ground, where the eggs are laid. Wet weather interferes with oviposition, which stops completely during rain. Soil temperature seems to be the dominant factor, most eggs being laid when it is 31–33°C. [87·8–91·4°F.]. Newly laid eggs are killed when the soil temperature rises to 50–60°C. [122–140°F.].

[Rodionov (Z. S.).] **Родионов (З. С.) On the Attitude of various Groups of Insects towards vaporous-gaseous Insecticides.** [*In Russian.*]—*Wiss. Ber. moskau. St. Univ.* **4** (Biol.) pp. 116–121. Moscow, 1935. (With a Summary in English.) [Recd. March 1936.]

The causes of the difference in the degrees of susceptibility of various types of insects to fumigation are discussed, and it is suggested that from this point of view insects may be divided into several distinct groups, each comprising species that are widely separated systematically but have certain physiological or biological characters in common. In experiments, various insects were exposed to a definite concentration of hydrocyanic acid gas or chloropicrin, and the species were classified into four groups, according to the time required to kill them. The species of the first (most resistant) group are inactive and protected with a thick layer of chitin, and some of them feed on decomposing matter and live in situations where they are not easily reached by the fumigants. Those of the second group are more active, liking sun and air, and are covered with a less thick layer of chitin. The third group is composed of insects that have only a thin layer of chitin and most of which fly well, and the fourth of very small, slightly chitinised insects that live in exposed situations.

[Rodionov (Z. S.).] **Родионов (З. С.). On the poisonous Action of Sulphur for Insects.** [*In Russian.*]—*Wiss. Ber. moskau. St. Univ.* **4** (Biol.) pp. 122–128, 19 refs. Moscow, 1935. (With a Summary in English.) [Recd. March 1936.]

The author's belief that sulphur dust only kills *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.) by actual contact was confirmed in experiments in which mites on cucumber leaves were separated from particles of sulphur by a thin silk net so that the distance between them was not more than 0·5–1 mm. In all cases all the mites remained alive. On the other hand, the fact that sulphur can kill mites without being in actual contact with them under certain conditions of temperature and humidity [*R.A.E.*, A **17** 286 ; **21** 161] was also confirmed in experiments in greenhouses, in which sulphur was applied to the brickwork of the flues and moistened with water during heating, with the result that in 3–5 days all the mites in the greenhouse were killed. It is probable that the sulphur volatilises with the water vapours and settles on the leaves of the plants. This was confirmed in laboratory experiments, in which a flask of water containing sulphur was heated, and air bubbled through it was passed through a cooled tube into another flask. The turbid-whitish sediment that eventually condensed in the latter flask gave off when burning the characteristic odour of sulphur dioxide, which showed that sulphur had volatilised with the vapours of the water. The yellow liquid that remained in the first flask contained salts of thiosulphuric acid, and when applied against mites, produced a mortality of 42 per cent.

Analysis of the derivates of sulphur indicated that the effect of sulphur on the red spider is due to thiosulphuric acid ($H_2S_2O_3$). Special experiments showed that the salts of this acid act as a contact acaricide, all mites being killed in 5–10 minutes when infested leaves were moistened with a 1 per cent. solution of sodium thiosulphate ($Na_2S_2O_3$). When sulphur dust is applied to infested plants, all chemical processes occur on the surface of the minute particles of the preparation, and within a certain time these particles become covered with a highly concentrated solution of thiosulphuric acid, which kills the mites that come in contact with it.

The possibility of increasing the formation of thiosulphuric acid salts by adding sodium sulphite (Na_2SO_3) to the sulphur was studied in experiments in which ground sulphur was moistened with a 2 per cent. water solution of Na_2SO_3 and then dried, and the resulting dust was applied to plants infested with mites in greenhouses at temperatures varying from 18 to 40°C. [64·4–104°F.], or to mites in test-tubes at 18–23°C. [64·4–73·4°F.]. The results are tabulated. In all cases, a higher percentage of mortality was obtained from the sulphur treated with sodium sulphite. In open test-tubes at 30°C. [86°F.] the greater effectiveness of the treated sulphur was even more marked, the percentage of mites killed in 4, 8, 12 and 24 hours being 62, 71, 95 and 100 respectively, as against 28, 36, 59 and 88 with untreated sulphur.

Laboratory and field tests showed that sulphur ceases to be effective against *Tetranychus* 2–3 days after application. This is probably due to the decomposition of the thiosulphuric acid and the formation of a layer of some inactive combination on the surface of the particles of sulphur.

[VUKASOVIĆ (P.).] **Вукасовић (П.). Sur le régime d'***Ephestia kuehniella* **Zell., papillon nuisible.** [*In Serbian.*]—*Arkh. Min. Pol'oprivr.* **1** no. 1 reprint 8 pp., 1 ref. Belgrade, 1934. (With a Summary in French.) [Recd. March 1936.]

In view of Candura's results on variations in the number of annual generations of *Ephestia kühniella*, Zell., according to the food of the larvae [*R.A.E.*, A **17** 329], experiments on their diet were carried out in Belgrade. In tests of the degree to which they are polyphagous, it was possible to rear them on raisins, but not on the flour of beans or soy-beans, or on cacao (alone or mixed with flour).

In experiments in which batches of larvae that had hatched from eggs of the same female were reared under identical conditions on wheat flour alone or mixed with glucose, peptone or starch, the duration of development and rate of mortality increased as more admixture was added to the pure flour ; thus, in wheat flour alone practically all the larvae gave rise to adults in a mean period of 137 days, whereas in a mixture of flour, starch and peptone (1 : 2 : 2), 83 per cent. died and the few that survived reached the adult stage in an average of 277 days.

In another series of experiments, maize flour proved to be the most nourishing medium, development in it being completed in a mean of 83 days at 26–28°C. [78·8–82·4°F.] as compared with 123 and 217 days in barley and rice flours, respectively, 102 days in unsifted wheat flour and 188 in sifted wheat flour. Moreover, larvae that fed on maize flour and the resulting adults were the largest in size, and mortality was only about 14 per cent. as against 38–66 in rice flour. Great differences occurred in the rate of development of individual larvae of the same lot, hatched from eggs of one female and reared in the same medium, this being particularly noticeable in the case of the less nourishing diets. These facts show how difficult it is to estimate how many generations of *E. kühniella* occur in a year.

[VUKASOVIĆ (P.).] **Вукасовић (П.). Sur les variations dans la durée du developpement du papillon nuisible** *Ephestia kuehniella* **Zell.** [*In Serbian.*]—*Glasn. hig. Zav.* **10** no. 3–4 pp. 23–34, 1 ref. Belgrade, 1935. (With a Summary in French.) [Recd. March 1936.]

Further investigations [*cf.* preceding paper] on variations in the development of the larvae of *Ephestia kühniella*, Zell., on different foods indicated that development is prolonged when the larvae are crowded in small containers and confirmed the fact that it is accelerated by rich food (maize flour as compared with sifted wheat flour) [see also *R.A.E.*, A **22** 717]. Special investigations showed that the presence of fat in the food is of great importance in accelerating development.

Individual variations in rate of development were observed by rearing singly larvae that had hatched about the same time from eggs of the same female. The period of emergence could be divided into two parts ; during the first, which lasted 14 days, the great majority of the moths emerged, and during the second, which lasted up to 101 days, individual moths emerged at long intervals. The retardation of development that resulted in late emergence occurred chiefly in the larval stage. Males seemed to be more susceptible to individual variations than females, and the mean duration of their development was longer.

[VUKASOVIĆ (P.).] **Вукасовић (П.). Sur l'invasion de la chenille de** *Lymantria dispar.* [*In Serbian.*]—*Arh. Min. Pol'oprivr.* **1** no. 2 reprint 32 pp., 7 figs., 1 graph, 1 ref. Belgrade, 1934. (With a Summary in French.) [Recd. March 1936.]

A severe outbreak of *Porthetria* (*Lymantria*) *dispar*, L., occurred in central Jugoslavia in 1934. As early as the beginning of May vast forests of oaks and beeches and plum orchards in a number of districts were completely defoliated by the larvae. The outbreak was probably due to the dry and warm weather that prevailed in 1934 and to the absence of parasites in 1933, following a wet and cold spring. During the winter, egg-batches were numerous on walls, stones, hedges, etc., and particularly on the stems and main branches of the trees. In the laboratory, females usually laid all their eggs in one mass, and remained on them motionless until death, which usually occurred in 6–7 days. The number of larvae that hatched from individual egg-masses ranged from 315 to 712, with an average of 475. From 9 to 17 days elapsed between the hatching of the first and last eggs in a batch. This period varied with the temperature, being about 14 days at 18°C. [64·4°F.] and 10 at 27·2°C. [80·96°F.] In the field, owing to hot weather, the eggs began to hatch as early as the second half of March in the south of the infested area, and in April in the northern and mountainous localities. In the laboratory at 18–20°C. [64·4–68°F.] the larvae remained on the egg-mass for 24 hours and then crawled upwards to the part of the container most exposed to the light. There they rested for about 5 days without taking the food offered them. After this they began to crawl down to feed, and all had done so by the 8th day. Newly hatched larvae resisted starvation for 9 days at 19°C. [66·2°F.] and for 5 days at 27°C. [80·6°F.], and when given food developed normally. Of those deprived of food for a further 48 hours, however, all succumbed. Fasting larvae became incapable of feeding 2–3 days before death took place.

Owing to carriage of the young larvae by strong winds, plum orchards at a distance of several thousand yards from the infested forests became infested in the course of 3–4 weeks. The dry warm weather also favoured the dispersal of the larvae, as those that had fallen to the ground could easily crawl onto a food-plant. In some districts, migrations of large numbers of older larvae, which were too heavy to be carried by wind, were observed in May from defoliated forests to uninfested orchards. Everywhere the infestation invariably started in oak forests, particularly old ones, the trees being defoliated from the tops downwards. Beech, willow, elm, maple, ash and other trees were also attacked, though less severely, *Robinia pseudacacia* alone almost entirely escaping. Of fruit trees, preference was always shown for apple ; apple trees growing in slightly infested plum orchards were completely defoliated. Other trees in order of preference were plums, cherries and apricots ; peaches were but slightly infested, pears escaped in many instances, and mulberry was completely untouched. Where the outbreak was very severe, fully grown larvae attacked the leaves of maize, potatoes, beans and wheat.

In the field, the injury continued for about two months. In the laboratory at a mean temperature of 23·4°C. [74·12°F.] the larvae completed development in a minimum of 32 days, but individuals that hatched from the same egg-mass showed great variations in the duration of development. At a mean temperature of 24·4°C. [75·92°F.] the pupal stage ranged from 11 to 14 days, and at 23·3°C. [73·94°F.] development from hatching to adult emergence lasted 44–56 days. In the field, pupation took place on the trees, groups of 30–100 cocoons occurring on the trunks and branches ; if the trees were not completely defoliated, the larvae pupated in leaves, which they rolled separately or joined together with a web.

The adults were on the wing from 24th May to 7th July, the flight period, which was very irregular, varying in different localities from 28 to 44 days.

Contrary to observations by other investigators, the females usually emerged simultaneously with the males, both from pupae reared in the laboratory and from those collected in the field. In all cases the maximum number of females (80–87 per cent.) appeared in the course of the first half of the flight period. Of the moths collected in different localities and at different times, 61–76·1 per cent. were males, and the number of females equalled that of the males in one instance only.

Natural enemies observed during the outbreak were the predacious Carabid, *Calosoma sycophanta*, L., which was abundant in one locality only; *Apanteles* sp., which occurred everywhere, though only in small numbers, and parasitised young larvae; and other Hymenopterous and Tachinid parasites, which attacked 10·3 and 42·6 per cent. respectively of the mature larvae and pupae. Parasites were more active in recently infested localities than in the centres of the outbreak.

In most cases no control measures were undertaken, but in some places egg-masses were collected in winter and destroyed, and young fruit trees were protected by jarring of the branches to dislodge the larvae, which were then killed on the ground. To prevent the survivors crawling up the tree, a thin layer of coarse wool tied round the trunk gave excellent results, as large numbers of larvae often congregated under the band and were destroyed. Spraying in the spring with a preparation of the Paris green group containing 56–58 per cent. arsenic and 30–32 per cent. copper oxide, applied at the rate of 1–1½ lb. in 100 gals. water, gave good results. Two applications proved sufficient to safeguard the trees from infestation, the first, which is directed against newly hatched larvae, being made as late as possible, when the leaves are open and no more larvae are brought over by the wind, and the second in the middle of the summer as soon as the older larvae begin to migrate from defoliated areas. In the case of very young trees, however, spraying should be effected as soon as the larvae appear, and repeated several times.

In laboratory tests against the eggs, all were killed by a 50 per cent. light mineral oil emulsion, and practically all by a 12·5 per cent. tar distillate.

Szelényi (G.). **Some Observations from the Life History of the Poppy-weevil** (*Ceutorrhynchus macula-alba* **Hrbst.**). [*In Magyar.*]—*Rep. Hung. agric. Exp. Sta.* **38** no. 5–6 pp. 217–224, 2 figs. Budapest, 1935. (With Summaries in German and English.) [Recd. March 1936.]

The following is based on the author's summary of observations on the bionomics of *Ceuthorrhynchus macula-alba*, Hbst., which is a serious pest of poppy in Hungary. There is one generation a year, hibernation occurring in the adult stage in the pupal cell in the soil. The adults occur in the poppy fields from about mid-May until mid-July. They feed on the foliage of the poppy plants and lay their eggs in the capsules during and immediately after the flowering period. The larvae hatch in 4–7 days and feed on the partition walls of the capsules and on the seeds for 2–3 weeks, after which they eat their way out and enter the soil to pupate. The prepupal and the pupal stages last 2 and 2–3 weeks, respectively. The condition of the soil when the larvae abandon the capsules and enter it for pupation is of importance in their survival, as observations in the insectary showed that they have difficulty in penetrating even a damp and loose soil and that a hard and dry one may prevent their further development.

In view of the long period of flight and oviposition, late sowing will not safeguard poppies from infestation. Of insecticides tested for control, the best results were obtained with a derris preparation applied during the flowering period.

Ripper (W.). **Die tierischen Schädlinge des Feldbaues im Jahre 1935.** [Animal Pests of Agriculture in Austria in 1935.]—*Neuheiten PflSch.* **29** no. 2 pp. 52–53. Vienna, April 1936.

This list of pests of field crops in Austria in 1935 includes the following new records for the country : *Maladera holosericea*, Scop., on root-crops and lucerne ; *Sitona crinita*, Hbst., and *S. puncticollis*, Steph., on various leguminous crops ; *Adelphocoris lineolatus*, Goeze, on lucerne ; *Phorbia genitalis*, Schnabl, on cereals ; and the larvae of *Phyllobius pyri*, L., and *Meromyza variegata*, Mg., attacking grasses.

Ripper (W.). **Die Bekämpfung der Engerlinge am Rübenfeld.** [Control of Melolonthid Larvae in the Beet Field.]—*Landeskultur* **2** pp. 164–166. Vienna, 1935. (Abstr. in *Neuheiten PflSch.* **29** no. 2 p. 67. Vienna, April 1936.)

In Austria the larvae of *Melolontha melolontha*, L., are chiefly injurious to sugar-beet in fields that are close to oak forests or horse-chestnut trees. Damage is greatest immediately after the plants have been thinned when they may be destroyed in two days. Those that show signs of injury should be treated by injecting carbon bisulphide into the soil at the rate of about $\frac{1}{6}$ oz. per plant shortly after thinning in May or about $\frac{1}{3}$ oz. in June. Plants that have been treated should be marked to prevent further treatment after a second inspection.

Magerstein (—). **Die Blattminierfliege als Luzerneschädling.** [An Agromyzid Leaf-miner as a Pest of Lucerne.]—*Landw. Fachpr. Tschechosl.* **13** p. 182, 1935. (Abstr. in *Neuheiten PflSch.* **29** no. 2 p. 71. Vienna, April 1936.)

Agromyza (*Domomyza*) *nana*, Mg., mines in the leaves of lucerne in Czechoslovakia, especially in summer. A late generation sometimes infests the autumn growth. The value of the leaves for fodder is reduced by the excreta within them, but not to any great extent when they are made into hay. A severe infestation reduces seed production in lucerne grown for seed.

Nunberg (M.). **Klucz do oznaczania ważniejszych szkodliwych owadów leśnych.** [Key for the Identification of the most important Insect Pests of Forests.] [*In Polish.*]—Demy 8vo, 288 pp. 359 figs. Warsaw, Inst. badawczy Lasów państw. (Inst. Rech. Forêts domaniales), 1935.

This series of keys to insects attacking coniferous and deciduous forest trees is arranged by food-plants, under which the pests are identified by the type of damage caused and the morphological characters of the injurious stage. Only the popular names of the trees are given. A systematic list of the species involved in the key and an index are appended. In an introductory section, brief notes are given on the morphology, metamorphosis and classification of insects, the various types of injury caused by them to plants, and the method of using the keys.

KUNIKE (G.). **Vorratsschädlinge und ihre Bekämpfung.** [Pests of Stored Products and their Control.]—*Flugbl. Biol. Reichsanst.* no. 62–63 (2nd revd edn), 11 pp., 24 figs. Berlin, March 1936.

This circular on pests of stored products and seasoned timber in Germany comprises a brief account of recognised mechanical and chemical measures, and lists of materials with the types of pest peculiar to them, of useful proprietary preparations showing their purpose, and of the more important pests.

WITTERSTEIN (F.). **Studien über den Mottenflug des Heu- und Sauerwurms in den Jahren 1933–1935 in Geisenheim a. Rh.** [Studies on the Adult Flight of the Spring and Summer Generations of Vine-moths in 1933–35 at Geisenheim a. Rh.]—*Anz. Schädlingsk.* **12** no. 3 pp. 25–30, 5 graphs, 8 refs. Berlin, March 1936.

The investigations here described were made at Geisenheim on the Rhine to supplement other work on factors affecting the flights of the adults of the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. [*cf. R.A.E.*, A **13** 396; **15** 384; **16** 545; **20** 50; **21** 203, etc.] Tables record the temperature, relative humidity, rainfall and number of moths of each species in each of the months May, June, July and August for the years 1933–35, and graphs show the abundance of the generations on various dates of which the meteorological conditions are indicated. The flights of both species are almost or completely inhibited by rain, unless it is very slight, and by strong winds or extremes of temperature, but *P. botrana* is not susceptible to dryness, whereas *C. ambiguella* ceases to fly if the air is very dry. This fact may be one of the reasons why at Geisenheim *P. botrana* usually predominates over *C. ambiguella*.

HUNDERTMARK (A.). **Die Wirkungsweise verschiedener Kontakt- und Frassgifte bei Bestäubung auf Bienen.** [The Mode of Action of various Contact and Stomach Poisons dusted on Bees.]—*Anz. Schädlingsk.* **12** no. 3 pp. 30–33, 13 refs. Berlin, March 1936.

In the course of investigations during an outbreak of the nun moth [*Lymantria monacha*, L.] in Prussia, laboratory experiments were made in dusting honey-bees with arsenical and contact poisons, nearly all proprietary preparations. In general the contact dusts acted rapidly and would therefore be less harmful, as affected bees would be unable to regain the hive and contaminate the pollen and nectar.

BUHL (C.). *Helophorus porculus* **Bedel als Stoppelrübenschädling.** [*H. porculus* as a Pest of Turnips.]—*Anz. Schädlingsk.* **12** no. 3 pp. 34–35. Berlin, March 1936.

In November 1935 turnips were attacked in the Lower Rhine region by the larvae of the Hydrophilid, *Helophorus porculus*, Bedel, which ate into the leaf-stems and the surface of the roots. The leaves yellowed and fell and the roots shrivelled up in dry, warm weather and rotted in wet weather. Similar infestation is known to occur in the adjoining provinces of Holland, but only one specimen of the beetle has been recorded in Germany, in 1884. Larvae brought indoors on 6th November and fed exclusively on turnips produced the last adults on 24th December and young larvae appeared on 4th February 1936. The adults shelter by day in the ground and skeletonise the leaves by night. Larvae that had been placed in the ground in the open had not developed further on 23rd January, so that they apparently hibernate.

ABRAHAM (R.). **Fasanen als Helfer im Kampf gegen die Gartenhaarmücke.** [Pheasants as Helpers in combating *Bibio hortulanus*.]—*Anz. Schädlingsk.* **12** no. 3 p. 36, 1 fig. Berlin, March 1936.

In connection with the occurrence of *Bibio hortulanus*, L., as a pest of cereals in Germany [*R.A.E.*, A **24** 268, 290], it is stated that the crop of a pheasant shot in the island of Langeoog contained 976 larvae of this fly weighing 49·7 gm., as against 3·1 gm. of vegetable food. Nearly every pheasant shot on the island contained these larvae.

HERING (M.). **Die Blatt-Minen Mittel- und Nord-Europas.** [The Leaf-mines of Central and North Europe.]—Lief. 2, pp. 113–224, 83 figs., 2 pls. Neubrandenburg, G. Feller, 19th February 1936. Subscription price, *M.* 9 per Lieferung; separately *M.* 13·5. (In Germany and Switzerland *M.* 12 & *M.* 18.) [Recd. May 1936.]

In this second part of a series of keys to leaf-mines due to insects [*R.A.E.*, A **24** 17], keys are given from *Bromus* (part) to *Filipendula* (part).

QUANJER (H. M.). **Geschiedenis van het onderzoek over de vergelingsziekte en de mozaiekziekte van de biet.** [History of the Investigations on Virus Yellows and Mosaic of Beet.] ROLAND (G.). **Onderzoek van de vergelingsziekte van de biet, met enkele opmerkingen over de mozaiekziekte.** [An Investigation on Beet Virus Yellows with some Remarks on Mosaic.]—*Tijdschr. Plziekt.* **42** no. 3 pp. 45–70, 5 pls., 3 pp. refs. Wageningen, March 1936. (With Summaries in English.)

The first paper, which is based on observations in western Europe, experiments and a study of the literature (to which references are given), is designed to clear up existing confusion regarding virus yellows and mosaic of beet and to serve as an introduction to the second paper, which gives the results of investigations made in 1935 at Wageningen, Holland. Virus yellows (jaunisse, vergelingsziekte) occurs in northern France, Belgium and Holland. Its chief symptoms are yellowing, brittleness, shortness and thickness of the nearly full-grown leaves, gummosis in the sieve tubes (except in the youngest parts of the plant) and accumulation of carbohydrates in the leaves. The beet mosaic described by W. W. Robbins in the United States [*R.A.E.*, A **10** 242] is apparently a complex of mosaic and a type of virus yellows, and mosaic in spinach in Germany [**15** 373] was associated with virus yellows in its later stages. The occurrence of virus yellows in Denmark has been proved by the author by anatomical examination of material from that country. The virus remains during the winter in the roots destined for seed production, and spreads from second-year crops grown for seed to first-year crops grown for roots. It is not carried over in the seed, nor is it sap-transmissible from beet to beet. In 1936 D. A. van Schreven at Bergen op Zoom, Holland, proved that it can be transmitted by *Aphis fabae*, Scop. In 1934 W. Kakebeeke at Wageningen obtained evidence of transmission by *Myzus persicae*, Sulz., and his work was confirmed by Roland, as described in the second paper.

The virus of mosaic of sugar and fodder beet remains during winter in the roots destined for seed-production and spreads from second- to first-year crops. It is not seed-transmissible, but is transmitted by Aphids [**15** 111, 570] and by juice inoculation. I. A. Hoggan [**21** 536] published property studies in vitro that are reliable. The physiological disturbances in plants suffering from mosaic are quite different from those in plants suffering from virus yellows and are restricted to the leaves. Spinach is a host of the mosaic virus in Germany and America [**15** 570 ; **21** 536], and *Chenopodium album* is also a host in England [**22** 437]. In Russia *C. album*, *Amarantus retroflexus* and *Sonchus arvensis* were infected by means of *Aphis fabae*, the virus from *A. retroflexus* and *S. arvensis* being subsequently re-transmitted to healthy beet.

In the second paper Roland deals chiefly with virus yellows, but adds some information on mosaic. His description of virus yellows agrees with that of Quanjer. It was transmitted in experiments at Wageningen by *Myzus persicae* and less readily by *Aphis fabae*, but not by *Empoasca* (*Chlorita*) *flavescens*, F., or *Lygus pratensis*, L. Strong light and a dry atmosphere promoted the appearance of symptoms. It was also transmissible by grafting half a diseased beet on half a healthy one. Analysis by means of polarisation showed an average of 56 gm. sugar per diseased beet against 140 gm. per healthy one. Measures against the Aphids are feasible only on plants used for selection. Great care must be taken in choosing the plants to be kept for seed production in the following year.

In observations on mosaic it was noticed that a virus can produce different reactions according to the stage of development of a plant, so that the type of mosaic cannot be determined by the symptoms seen on one beet leaf. Transmission by *Myzus persicae* was confirmed. In the greenhouse the incubation period was 11 days. It was twice as long in plants exposed for 4 hours daily to radiation from a Neon lamp, so that the effect of light was different to that with virus yellows.

SPIERENBURG (D.). **Een virusziekte in lupinen.** [A Virus Disease in Lupins.]—*Tijdschr. PlZiekt.* **42** no. 3 pp. 71–76, 2 pls. Wageningen, March 1936.

In the summer of 1935 a destructive mosaic-like disease, here described in detail, occurred in lupins in experimental plots at Wageningen, Holland, blue lupins being especially affected. A mosaic of blue lupins has been reported from New Zealand as transmitted by Aphids and as probably overwintering in red clover [*R.A.E.*, A **23** 723]. Fields of red clover were near the plots at Wageningen.

PIVERT (A.). **Observations sur le comportement du carpocapse en Anjou au cours des anneés 1934–1935.**—*Rev. Path. vég.* **23** fasc. 2 pp. 91–100, 1 diagr., 1 ref. Paris, April 1936.

Experiments on trapping adults of *Cydia pomonella*, L., from pear trees in Anjou during 1934 and 1935 indicated that activity began in mid-May in 1934 and after mid-June in 1935. This difference can be correlated with the fact that the mean temperatures (for periods of five days, taken an hour after sunset) in 1935 did not rise above 16°C.

[60·8°F.] until 17th June [*cf. R.A.E.*, A **24** 85, etc.]. Adults were taken until late August, and a few fruits were found to contain very young larvae up to late September. In 2 orchards, containing 3,000 trees and 17 traps, and 160 trees and 10 traps, the mean daily number of insects per trap did not differ greatly. In rearing experiments, the larval period was about 30 days, growth being particularly rapid when the larvae attacked the pips. The pupal period varied from 12 to 25 days for overwintered larvae, and from 10 to 15 days for those of the first generation, depending on the temperature. In Anjou, the second generation is less important than the first, and larvae begin to go into diapause from 15th–20th July. It is concluded that since the adults are active from May to the end of summer, with no fluctuation between broods, treatments must be applied continuously, but not until the temperature an hour after sunset has reached 15° C. [59°F.], or traps indicate that flights have begun.

FRAPPA (C.). **Sur une coccinelle phytophage nuisible aux solanées à Madagascar.**—*Rev. Path. vég.* **23** fasc. 2 pp. 145–155, 3 figs., 9 refs. Paris, April 1936.

Rearing experiments have been carried out since 1929 on *Epilachna* (*Solanophila*) *pavonia*, Ol., which feeds on various solanaceous plants throughout Madagascar, and is a pest of potato in the central part of the island, where this crop is extensively grown. The adult of this Coccinellid is described. After a pre-oviposition period of 3–8 days, the female deposits 125–300 eggs in batches of 25–40 on the lower surface of the leaves. The larvae hatch in 8–9 days and mature in 18–20. Pupation takes place on the lower surface of the leaves, and the pupal stage lasts 10–11 days. The life-cycle is longer for the first generation (which begins in late September) and the last, which hibernated in the pupal stage from June to September. Both larvae and adults devour the parenchyma of the leaves, causing them to wither, and also attack any new shoots that may be sent up. Control measures recommended include hand picking, the destruction of wild species of *Solanum*, particularly *S. auriculatum*, in areas where potatoes are to be planted, and the planting of early varieties, which miss the most severe infestation at the end of the season. It has been observed that plants sprayed with copper sulphate as a fungicide are less attacked.

The larvae are destroyed by the predacious Coccinellid, *Cydonia lunata*, F., but no parasites were found in the rearing experiments.

FRAPPA (C.). **Notes biologiques sur deux espèces de *Napta* malgaches.**—*Rev. Path. vég.* **23** fasc. 2 pp. 156–161, 2 refs. Paris, April 1936.

Larvae found damaging *Thuja* near Tananarive in February 1934 were reared to adults and proved to be the Lasiocampids, *Napta solida*, Saalmuller, and *N. serratilinea*, Gn. No parasites were reared, and it seems probable that the insects had migrated from the warmer districts in the east or west of Madagascar. In the insectary, the larvae, which fed heavily on *Thuja*, especially the young shoots, pupated (in cocoons on the food-plant) between 24th February and 26th March, and the first adult emerged on 16th March. With the material obtained, rearing was successfully continued until early July, when the insects all died, probably because of the cold. The egg, larval and pupal stages lasted about 8, 32 and 21 days, respectively, the preoviposition period about 3 days and adult life 8–10 days.

PAPERS NOTICED BY TITLE ONLY.

DAVIDSON (J.). **The Apple Thrips (*Thrips imaginis* Bagnall) in South Australia.**—*J. Dep. Agric. S. Aust.* **39** no. 7 pp. 930–939, 4 figs., 13 refs. Adelaide, February 1936. [*Cf. R.A.E.*, A **22** 448; **23** 506, 726; **24** 135.]

SHINJI (O.). **Description of *Astegopteryx pseudostyracophila* Shinji, a new Species of Aphididae from Japan.** [*In Japanese and English.*] —*Zool. Mag.* **48** no. 2 pp. 45–48, 1 fig. Tokyo, February 1936.

SHINJI (O.). **A new Species of *Orthezia* [*argrimoniae*] from Japan (Hemiptera-Homoptera).** [*In Japanese.*]—*Kontyû* **10** no. 2 pp. 91–92, 1 fig. Tokyo, March 1936.

SHINJI (O.). **A preliminary List of the armed Scale Insects of Morioka, Japan.** [*In Japanese.*]—*Kontyû* **10** no. 2 pp. 93–98. Tokyo, March 1936.

[SMIRNOV (E. S.) & POLEZHAEV (V. G.).] **Смирнов (E. C.) и Полежаев (B. Г.). Kampf um den Raum bei der Schildlaus *Lepidosaphes ulmi* L.** [Competition for Space by the Coccid, *L. ulmi.*] [*In Russian.*] —*Wiss. Ber. moskau. St. Univ.* **4** (Biol.) pp. 37–43, 16 figs., 4 refs. Moscow, 1935. (With a Summary in German.) [Recd. March 1936.] [Translation: see *R.A.E.*, A **23** 138.]

[MEĬER (MEYER) (N. F.).] **Мейер (H. Ф.). Tables systématiques des Hyménoptères parasites (fam. Ichneumonidae) de l'URSS et des pays limitrophes. Vol. V.** [*In Russian.*]—*Tabl. anal. Faune URSS* no. 21, 340 pp., 8 figs. Leningrad, Inst. zool. Acad. Sci., 1936. Price 15 *rub.* Binding 2 *rub.* [Continuation: *cf. R.A.E.*, A **24** 199.]

WILKINSON (D. S.). **Microgasterinae: Notes and new Species** [of *Apanteles* and *Microgaster*] **(Hym. Brac.).**—*Proc. R. ent. Soc. Lond.* (B) **5** pt. 4 pp. 81–88, 4 figs. London, 15th April 1936.

BORGMEIER (T.). **Sobre o cyclo evolutivo de *Chonocephalus*, Wandolleck, e uma nova especie de *Melaloncha* Brues, endoparasita de abelhas (Dipt. Phoridae).** [On the evolutive Cycle of *Chonocephalus*, Wandolleck, and a new Species of *Melaloncha* (*ronnai*, sp. n.), an Endoparasite of Honey-bees in Brazil.]—*Arch. Inst. Biol. veg.* **2** no. 2 pp. 255–265, 14 figs., 1 pl., 5 refs. Rio de Janeiro, December 1935. [Recd. March 1936.]

BONDAR (G.). **O podador de cacau.** [The Cacao Pruner, *Chalcodermus marshalli*, Bondar, in Bahia.]—*Rodriguésia* **1** no. 3 pp. 23–28, 3 figs., 2 pls. Rio de Janeiro, 1935. [Recd. April 1936.] [*Cf. R.A.E.*, A **22** 540.]

MOULTON (D.). **Two new Species of Thysanoptera in Argentina and Records of other Species** [*Frankliniella argentinae*, sp. n., and *Haplothrips trellesi*, sp. n., both from lucerne, etc.]—*An. Soc. cient. argent.* **120** no. 6 pp. 254–257 (also in Spanish pp. 258–261). Buenos Aires, 1935. [Recd. April 1936.]

TALBERT (T. J.), HASEMAN (L.), SWARTWOUT (H. G.) & TUCKER (C. M.). **Missouri Apple Spraying; Recommendations for 1936.**—*Circ. Mo. agric. Exp. Sta.* no. 190, 8 pp. Columbia, Mo., March 1936.

KELSALL (A.). **The Iron Sulphate and Lime-Sulphur Mixture as a Spray.**—*Canad. Chem. Metall.* **19** no. 9 p. 239. Toronto, September 1935. [*Cf. R.A.E.*, A **24** 147.]

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Parasitology. Vol. VI, Nos. 1–3. Vol. IX, No. 1 (Cambridge, 1913–16).
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Bulletins 24, 61 (1893–96). Technical Bulletin 8 (1915).
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Zeitschrift für das Landwirtschaftliche Versuchswesen in Österreich (Vienna) : 21 Jahrg. (1918) Hefte 1–3 & 10–12.

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